

The MINING CONGRESS JOURNAL

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No. 4

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Work of the National Safety Council
Safety Program of Old Dominion Company
Developing Responsibility for Accident Prevention
Flameless Powders Where Explosive Gas Is Absent

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Reports on the Mechanization Survey

Contributors:

W. Dean Keefer, I. H. Barkdoll, C. L. Hightower, C. E. Munroe,
R. R. Sayers, Herman Stabler, E. R. Phillips, Eugene Ireland, D. C. Mac-
kallor, A. F. Allard, Harvey B. Mann, G. B. Southward.



Economical-

The efficient buyer considers unit cost—cost per foot of track per year. In arriving at this cost figure, other items, aside from initial cost of ties, must be taken into consideration.

Length and character of service rendered, amount of labor involved in installing the ties, maintenance expense—all these must be included. On this basis, Carnegie Copper Steel Mine Ties provide a better track at a lower unit cost than wood ties.

Carnegie Ties are extremely easy to lay, involving a minimum of labor. Simply hit the clip with any convenient tool and the rail is firmly secured, automatically true to gauge. The tie is light and easy to carry. Sections of track may be shifted as a whole. In low seams of coal, it is unnecessary to dig channels in hard stone or clay to accommodate the ties inasmuch as they are extremely shallow.

Of outstanding importance is the fact that Carnegie Ties are made of copper steel. This copper content greatly retards corrosion, adding years to the life of the tie.

For better track, for more economical track, use Carnegie Copper Steel Mine Ties.

May our representative call?

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*General Offices---Carnegie Building
PITTSBURGH, PENNA.*

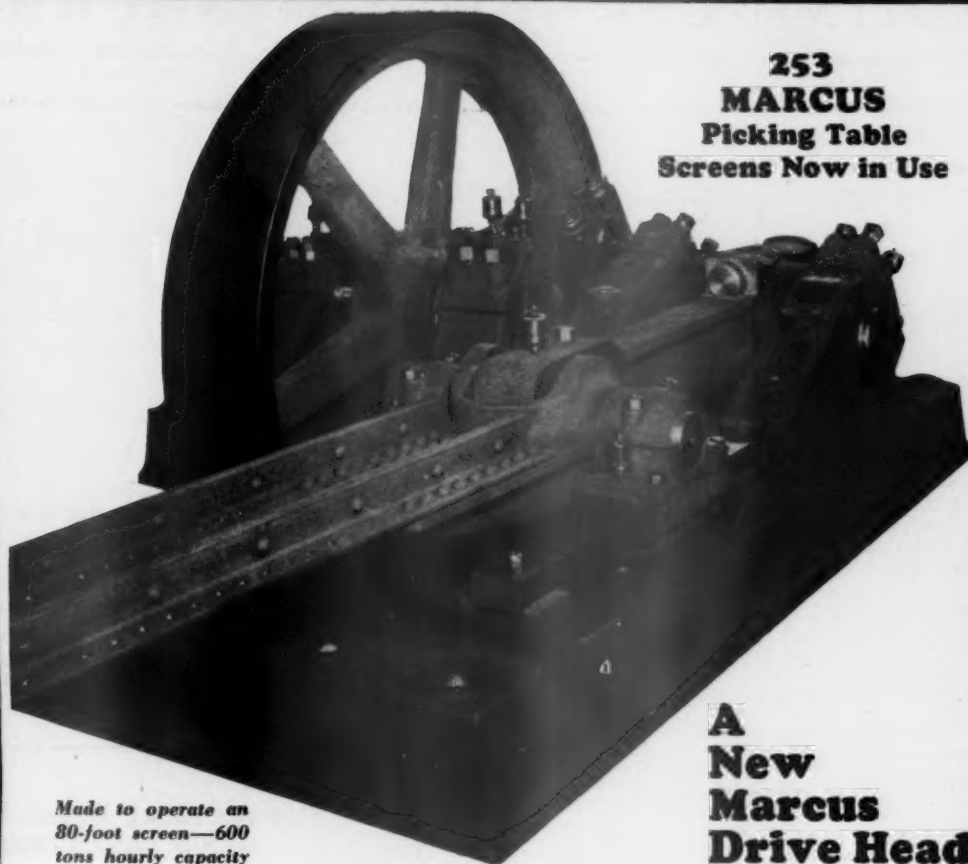


Copper Steel Mine Ties
Steel Mine Timbers

Wrought Steel Wheels
for Mine Cars and
Locomotives

Light Rails & Fastenings
Standard Rails
Steel Shapes, Plates
and Bars

CARNEGIE STEEL MINE TIES



**253
MARCUS
Picking Table
Screens Now in Use**

*Made to operate an
80-foot screen—600
tons hourly capacity*

**A
New
Marcus
Drive Head**

The Number 10 Marcus Drive Head, illustrated, was installed for operating Marcus Screens at the Crescent Tipple of the Pittsburgh Coal Company, a Marcus Screen with an hourly capacity of 600 tons, loading on three tracks and three barges.

A similar installation at the Melcroft Coal Company Tipple operates a 350-ton per hour Marcus Screen with side picking wings for Egg and Nut sizes—loading four sizes on four tracks.

This drive head is not a redesign of the old type. Rather it is an entirely new Marcus Drive Head, embodying new features of smoother operation and greater strength.

May we send you complete details on the new Marcus Drive Head and Marcus High Capacity Screen?

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COAL MINING PLANTS
MENZIES HYDRO
SEPARATORS
SHAKER AND APRON
LOADING BOOMS

ROTARY CAR DUMPERS
COAL TIPPLES AND
CLEANING PLANTS
ARMS CONCENTRATING
TABLES AND SCREENS

The MINING CONGRESS JOURNAL

VOLUME 14

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PRACTICAL OPERATING MEN'S DEPARTMENT

METALS

The Katherine Mill and Cyanide Plant

Mining Methods in the Tri-State District

COAL

Coal Preparing Plant of the Middlefork Mine, U. S. Fuel Company

Trend of Mechanical Drives for Coal Mine Service

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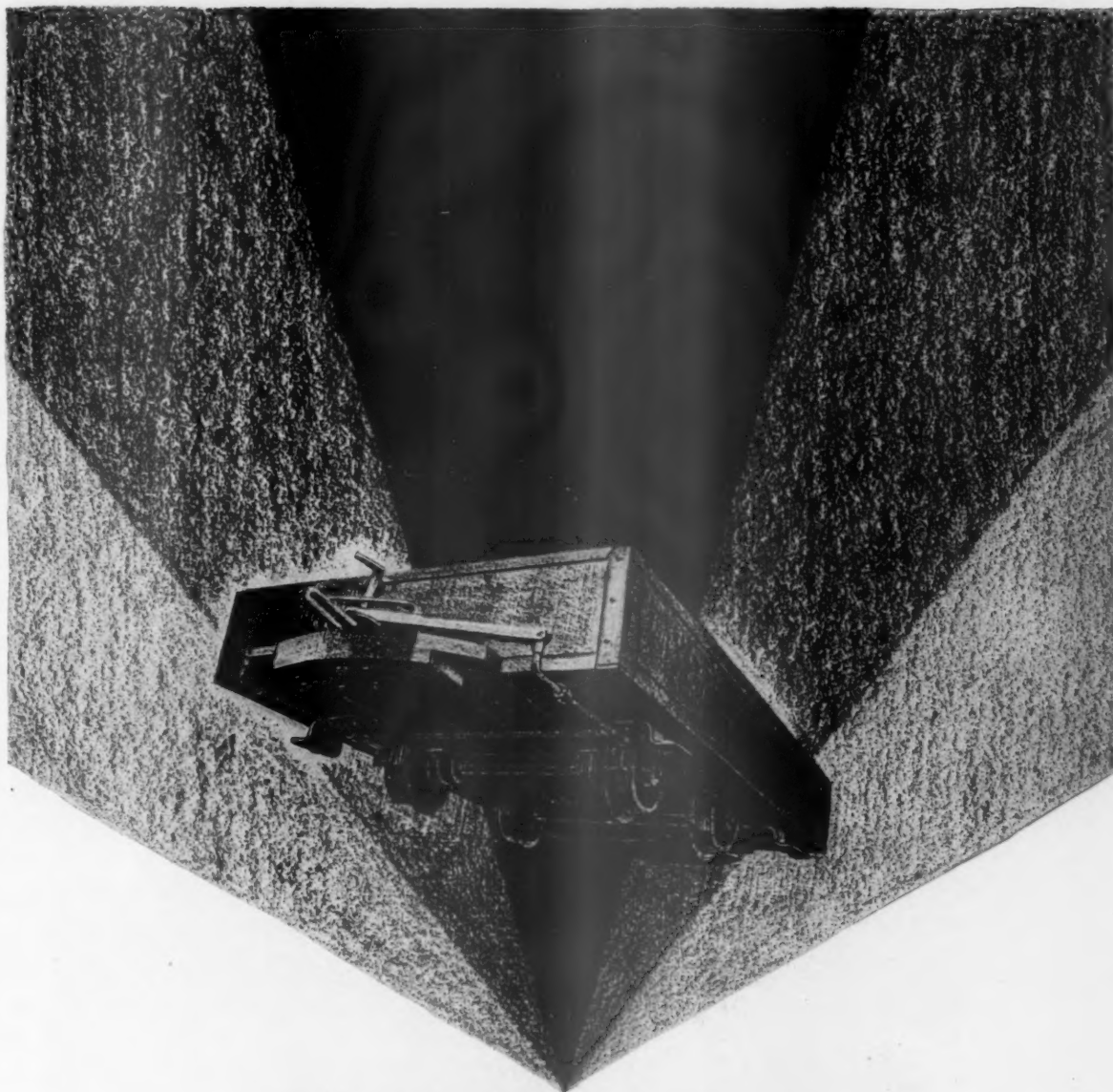
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Six Ton Locomotives for



Plenty of room for the motor-man in this Jeffrey Six-ton Gathering Motor taking out a trip of cars at Red Jacket, West Virginia.



The Jeffrey Manufacturing Company
958-99 North Fourth St., Columbus, Ohio

Branch Offices: New York Pittsburgh Scranton, Pa. Philadelphia Chicago Birmingham
Sales and Service Stations: Birmingham, 26 South 20th St. Winchester, Ky., 122 N. Main St. Salt Lake City, 153 W. Second South St.

JEFFREY

Built Low Coal

THESE Jeffrey six-ton Gathering Locomotives in the thirty-six inch Alma Thacker seam at Red Jacket, West Virginia, are low and compactly built.

Although only twenty-five inches in height over all, they are full powered and take standard size wheels, springs, gears and controllers.

Each pair of wheels is driven by a thirty H.P. ball-bearing motor, giving ten H.P. per ton, the standard requirement.

The wheels are twenty-four inches diameter, therefore they do not develop false flanges as readily as smaller wheels.

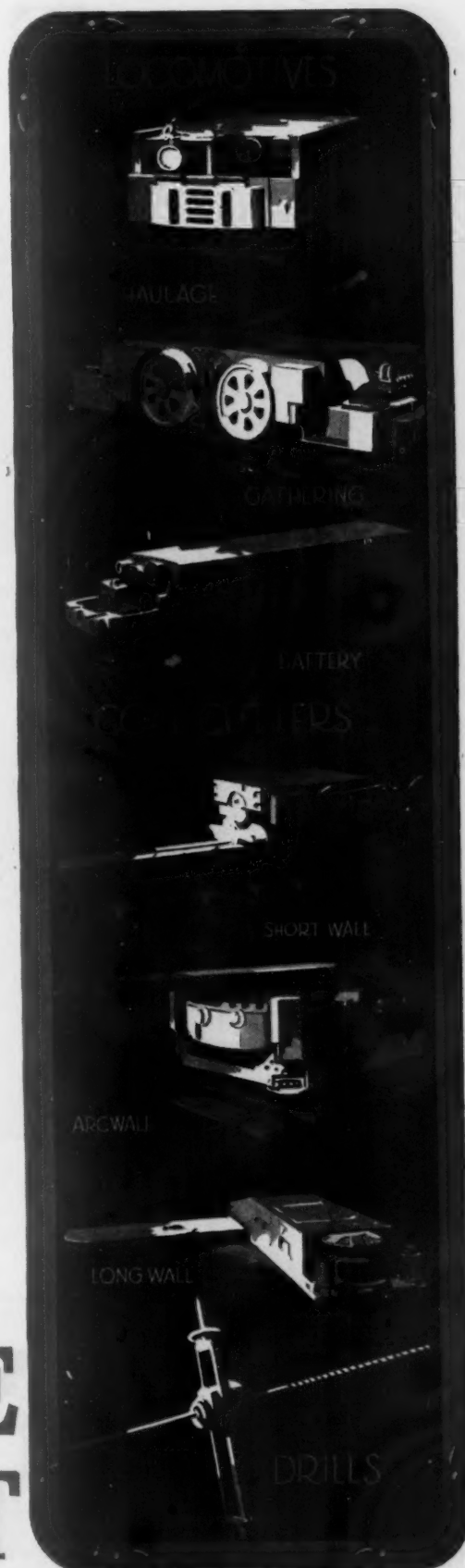
The controller box and all copper elements are full standard size, the controller fingers giving one-and-one-quarter inches contact at each point.

On a Jeffrey Gathering Motor the motorman has more leg room than in any other low vein locomotive built. A cushioned seat on the floor of the cab allows him to sit down comfortably under a low roof, his feet under the horizontal controller box, as shown in the upper photograph.

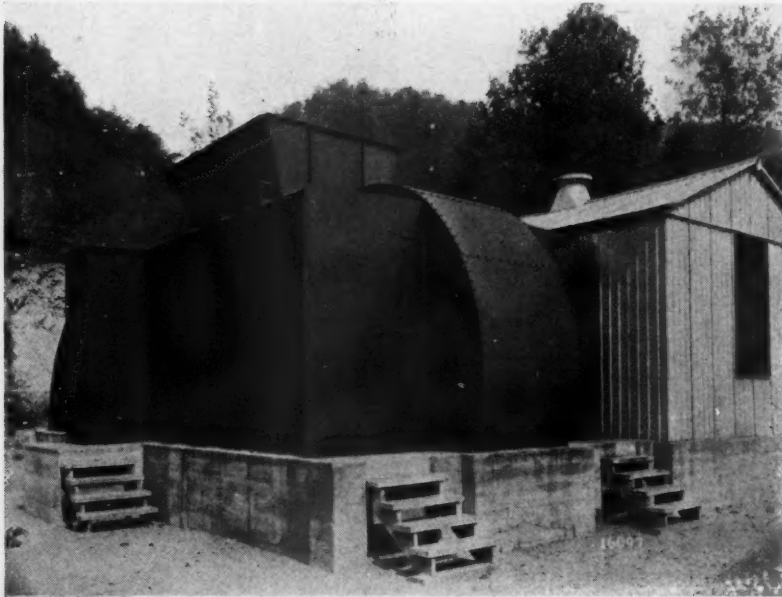
The horizontal controller box can be swung to a vertical position when the mine electrician wishes to inspect the contact points and clean the fingers.

Denver Charleston, W. Va. Salt Lake City Montreal, Canada
Pittsburgh, 600 Second Ave. Scranton, 122 Adams Ave. Terre Haute, Ind., 319 Cherry St.

COAL MINE EQUIPMENT



Why They Bought



Jeffrey Mine Fan at the West Virginia Coal & Coke Company, Stirrat, West Virginia, a 10' x 4' Double Inlet Primarily Exhaust Reversible Fan, capacity 150,000 cu. ft. per minute at 2 1/4" water gauge.



Jeffrey Mine Fan at the Island Creek Coal Company, Holden, West Virginia, a 12' x 5' Double Inlet Primarily Blowing Reversible Fan. Capacity 300,000 cu. ft. per minute at 3 1/2" water gauge.

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JEFFREY

Jeffrey Fans

ONCE a Jeffrey Mine Fan is set up and started, nothing can stop it except shutting off the power. A Jeffrey Fan is built for continuous service. Its strength lies in the self-aligning bearings, the stepped blades, welded wheels and heavy steel construction.

Its self-aligning bearings can never get out of order, and if properly oiled will last for years.

The stepped fan blades pick up the air at the center of the fan and push it toward the tips of the blades with an accelerated movement. When the air reaches the swiftly moving blades at the periphery, it is already moving so fast that there is no shock to the blade.

All Jeffrey Mine Fan wheels are of welded steel. There are no rivets to work loose and disturb the exact balance necessary for smooth running.

The Jeffrey Manufacturing Company

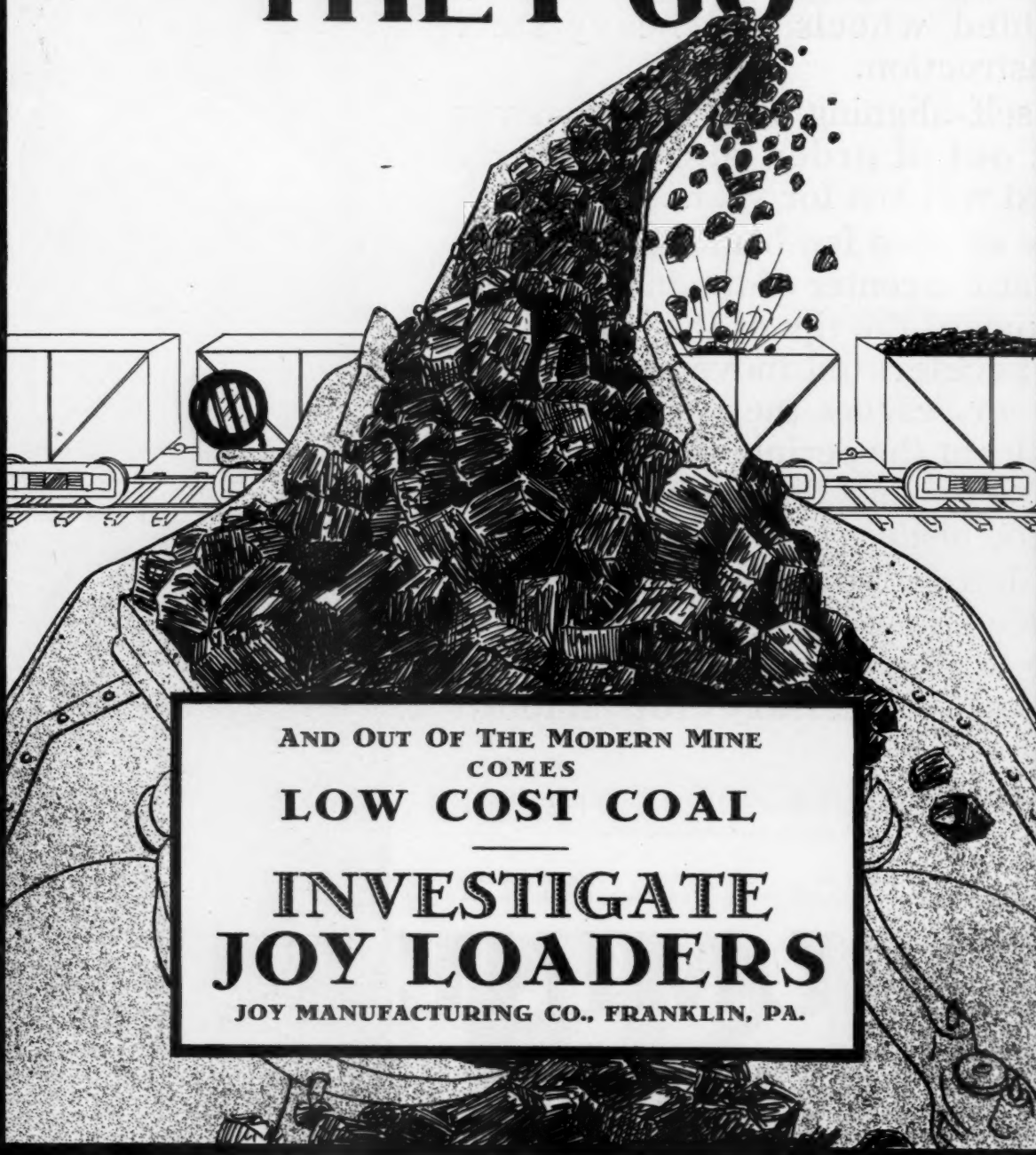
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Denver Charleston, W. Va. Salt Lake City Montreal, Canada
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COAL MINE EQUIPMENT



INTO THE MODERN MINE THEY GO



AND OUT OF THE MODERN MINE
COMES

LOW COST COAL

**INVESTIGATE
JOY LOADERS**

JOY MANUFACTURING CO., FRANKLIN, PA.

SYMONS

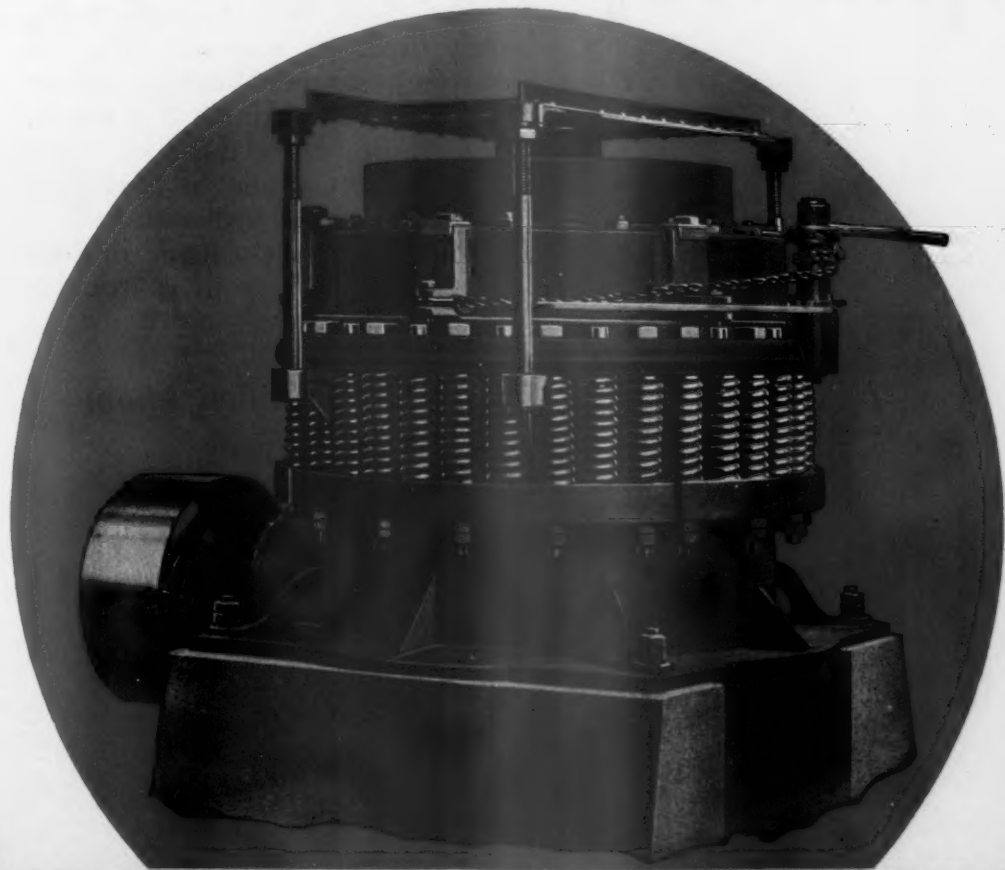
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SECOND—In crushing plants where more capacity of finer material for Rod or Ball Mill feed is required and space is limited, the CONE CRUSHER fits in.

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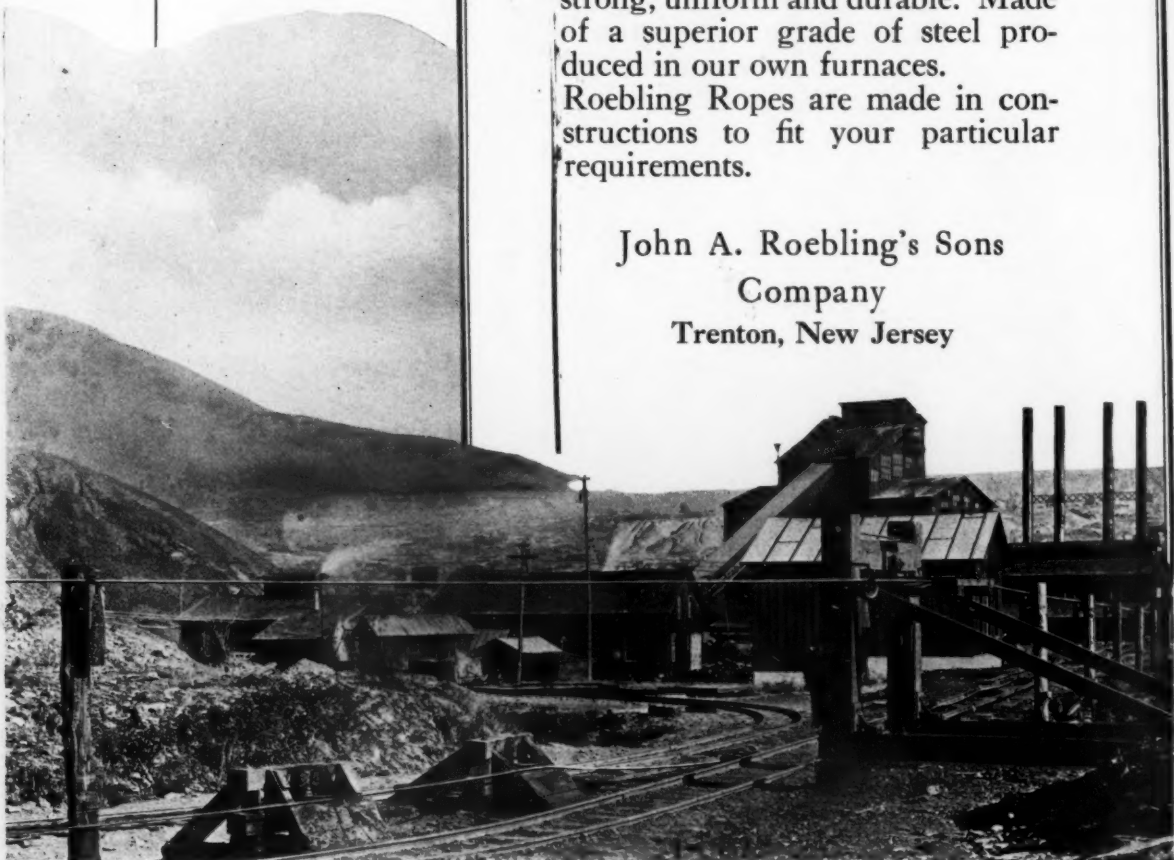
Roebling

"Blue Center" Steel Wire Rope

In the coal mining industry, wherever strains and stresses would ruin ordinary ropes, Roebling "Blue Center" Steel Wire Rope is extensively used. It is unsurpassed for stripping, scraper loading, refuse dumping and hoisting. It is tough, strong, uniform and durable. Made of a superior grade of steel produced in our own furnaces.

Roebling Ropes are made in constructions to fit your particular requirements.

John A. Roebling's Sons
Company
Trenton, New Jersey





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of grease," you say?*



THAT'S all you may call it today looking at this picture, "just a lump of grease".— But put it to work in your plant, watch it guard each bearing ceaselessly day after day, watch it save repair bills, banish oil drip and fire hazard, and you'll come to call Keystone Grease forever after by its proper name, Lubrication Plus!

Keystone Grease is a pure petroleum grease, containing no acid or metal-eating substance. Keystone Grease never lies down on its job, is not affected by heat or cold, always remains the same in consistency. At less cost, it furnishes more lubrication and better lubrication than any other known oil, grease or lubricating compound.—Do you realize how many ways you can use Keystone Grease? At no expense or risk to you we will gladly have one of our lubricating engineers arrange a demonstration in your own plant.

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Established 1884

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**“—nothing yet compares,
in actual results,
with the Scraper Loader
for a thin seam—”**

**Some
Substantial
SAVINGS:**

No room tracks
No gathering
No top brushing
No bottom lifting

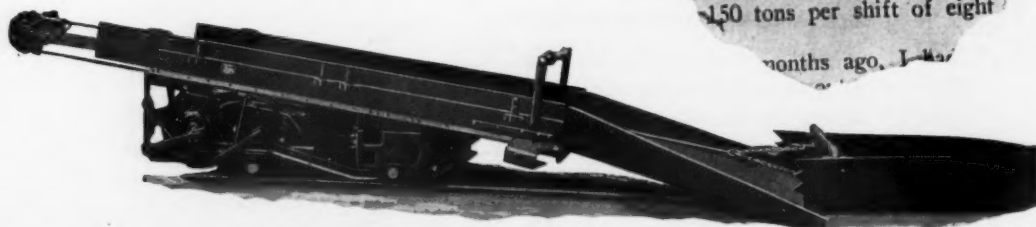
More lump
Bigger cars
Fewer working places
Concentrated mine
operation

Says W. E. James, Supt.,
Southern Smokeless Coal Co.,
in Coal Age, December, 1927.

IN RECENT YEARS I have examined a number of mechanical devices designed in a measure to eliminate the human element in the loading of coal, which is always more or less a source of trouble. I have come to the conclusion that where

mining conditions favor its adoption nothing yet compares in actual results with the scraper loader for a thin seam of coal, say from 36 to 42 in. thick with a good roof and a substantial bottom. Several of these loaders are doing good work in the Creek field, some of them averaging 150 tons per shift of eight

months ago. I have



Goodman 3-Drum Entryloader in Working Position, with scoop ready to slide up the chute.



Ready to travel to a new working place, under its own power, like a locomotive or mining machine.

The Scraper Scoop, sliding over the Mine Bottom at a speed of about 300 feet per minute—

Goes to the face
Picks up a load of $\frac{3}{4}$ ton
Returns to the room neck
Slides up the loading chute
Dumps the coal into the car and goes again to get another load.

A completely Self-contained Self-propelling Unit!

All done automatically, by three-rope control.

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GOODMAN ⁽⁸¹⁾ **MANUFACTURING COMPANY**
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AT THE AMERICAN MINING CONGRESS EXHIBIT

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"Everything for Mine and Industrial Safety"



K-3 Mine Hanger attached to mine roof by a Type A-3 Expansion Bolt. Fully described on pages 486-491 of O-B Catalog No. 20

The "New Thought" in Metal Mining

WITH the major problem of ore treatment solved, the "thinkers" in the industry are now turning their attention to the hundreds of smaller opportunities to make an accumulated large economy. Electric haulage and appropriate line material offer an opportunity to tap the source wherein many of these smaller economies will be found.

O-B

HANGERS

— do lower ton-mile cost —

WHERE metal is mined—where tons are hauled to get pounds of refined metal—good trolley hangers can play an important part in lowering the cost per ton-mile.

This is readily seen when one realizes that a hanger is the only insulation between a wire pulsating with energy and the ground. If the insulation of the hanger is not good,

much of this energy is lost. The voltage drops—motors become sluggish—train speed lowers—time per trip is longer—thus are haulage costs increased. These leaks are easily and profitably avoided by using O-B mine hangers. They will be avoided because O-B hangers have an insulation which is mechanically and electrically balanced.

Each hanger is tested at 7,000 volts. It will not "spill over". The galvanized stud bolt is molded in the insulation, and further insulated from the shell by a built-up mica disc. This stud bolt will not pull out under a mechanical load of 7080 times the weight of the complete hanger.

Pages 481 to 495 of the No. 20 Catalog will help you select the type of hanger best suited for your needs from among the hangers which are known to lower ton-mile costs.



Universal-2 Mine Hanger fully described on page 486 of O-B Catalog No. 20.



Jamme-1 Mine Hanger, No. 9230. See page 494 of O-B Catalog No. 20.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
796M

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PORCELAIN
INSULATORS
LINE MATERIALS
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CAR EQUIPMENT
MINING
MATERIALS
VALVES

In historic old New England the use of enduring materials is a tradition



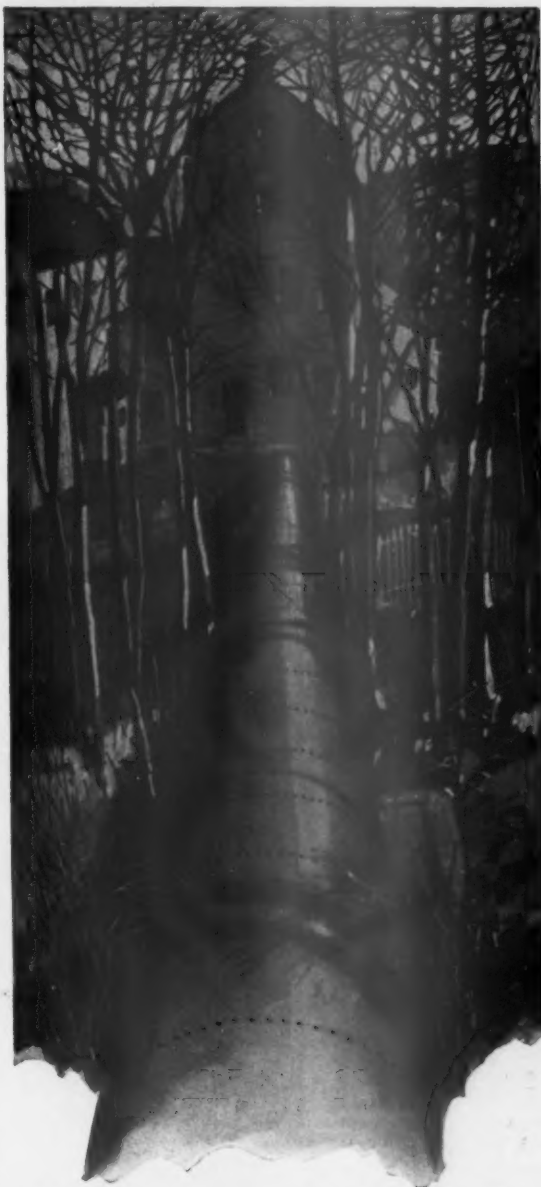
*This Old
wrought iron Flume
has defied corrosion
for half a century--*

IN no part of the country is the love of permanence more deeply rooted than in New England. To the New England mind, change and decay are "the old woe of the world." The inveterate fondness for enduring materials can be seen in every city or hamlet. Fine churches and town halls, dignified mansions, modest cottages, not a few, show the venerable character of things that last.

Even mills and factories built by the pioneers of industry in New England, share in this worthy tradition.

From such a mill, belonging to the United States Rubber Company, and known locally as "the Old Shop", one of the earliest "rubber and boot" factories of the Western Hemisphere, our present illustration is taken.

An old wrought iron flume, built half a century ago, supplies the old shop with its most vital necessity—plentiful volumes of water. Resting firmly on its stone supports, taken to the embrace of sturdy trees



which were not yet sprouted when the mill was built, the ancient flume has become so much a part of the landscape that generations of children have come to look upon it as belonging to the hill.

A more perishable material than wrought iron would long ago have crumbled to dust.

A time-tested and time-honored material it is, filling the practical mind with admiration and satisfying the sense of permanence—honest old-fashioned stuff with all its native slags and fluxes, and with enduring virtues as long familiar as the anvil and the forge.

Of such material, Byers Pipe is made. In New England, Byers Pipe has many of its staunchest friends. For water supply, plumbing, heating, and steam systems, unseen and often forgotten, Byers has faithfully served many generations of New England users.



*By the Byers Record,
All Pipe is Judged.*

A. M. BYERS COMPANY
Established 1864 Pittsburgh, Pa.

BYERS PIPE

GENUINE WROUGHT IRON

1. Preservative Value

Highest toxicity of all wood preservatives.

2. Cleanliness

No noticeable odor or discoloration.

3. Permanence

Low solubility. Cannot be drawn out of wood by external moisture.

4. Economy

Lowest cost per unit of toxicity of any wood preservative and longest life of mine timbers in service.

5. Dependability

Vouched for by best records of performance in long service.

6. Fire Retardant

Wolmanized mine timbers lessen the fire hazard in the mine.



Permanence

No. 3

While other preservatives are soluble up to over 600%, Wolman Salts have a maximum solubility of only 4½%. This low solubility is an important reason for the permanence of Wolman Salts as they cannot be drawn out of the wood by external moisture. In addition, the Wolman Salts combination of chemicals insures a fixation in the wood not heretofore known in wood preservation.

Wolman Salts do not exude. Permanency of the preservative means permanent protection against decay. Millions of mine props, lagging and ties have been Wolmanized during the past twenty years but there is no record of a single piece having been removed on account of decay.

American Wood Impregnation Corporation
25 Broadway, New York

United Wood Treating Corporation
1138 Lake Shore Drive, Chicago

WOLMANIZED TIMBERS!

This De Laval Pump has been Running Day and Night for

Performance records have guided the engineers of the Pittsburgh Coal Company in selecting mine pumps. They now have installed 112 De Laval Pumps of capacities ranging from 100 to 1050 gal. per min. against 30 to 455 ft. head, all in daily service. The five stage De Laval Pump shown herewith is located in their Model Mine and has been in continuous day and night operation for four years without being shut down a minute for repairs.

Ask for Catalog B.



4 Years

De Laval Steam Turbine Co., Trenton, N.J.

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To the right—

The "Myers-Whaley" Automatic Shoveling Machine

This is the well known "All Around
Loading Machine for Under-
ground Work"

Coal Loading—

Entry Driving—

Brushing—Top or Bottom—

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Rock Loading—

Grading.

Permissible—if required.



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AND NOW!

OUR NEW MACHINE

The Whaley Single Motion Shovel FOR COAL LOADING

Will be shown FOR THE FIRST TIME at the Cincinnati Exposition—American Mining Congress—May 7-11, and will be the FEATURE OF THE SHOW

Outstanding Advantages of this NEW MACHINE,

as shown in 18 months double shift operation are:

- (1) Smooth, easy loading movement—no "batting" around or degradation of coal.
- (2) CLEANS UP—no hand shoveling required to leave place in good shape for cutting machine.
- (3) Range and mobility—Cleans up 24 feet wide from one track and moves under its own power to next place without delay for adjustments.
- (4) Where coal is thin and top rock taken the low operating height of front end enables the machine to reach under and load coal first, then load the rock.
- (5) No dust is raised by this machine—a decided advantage especially in dusty and gaseous mines.

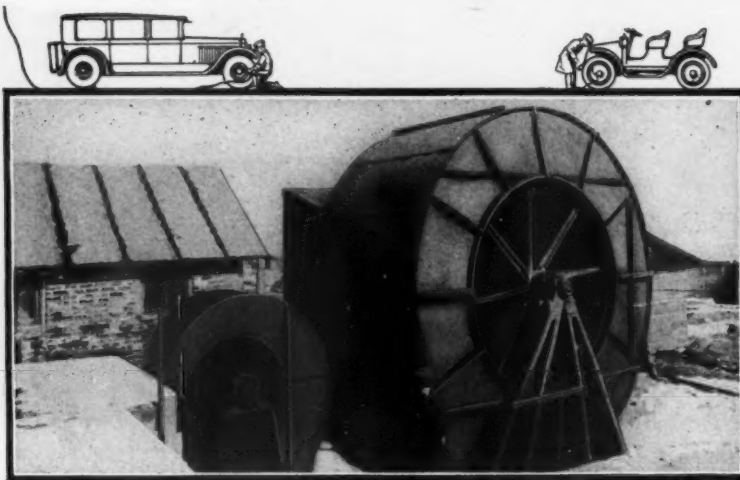
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Bringing Air Up to Date

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No. 299
AT CINCINNATI
CONVENTION
May 7-11

ROBINSON

ZELIENOPLE Ventilating CO. PENNSYLVANIA



American Wire Rope

AND
AERIAL WIRE ROPE TRAMWAYS

Send for Illustrated Catalogue

American Steel & Wire

Chicago-New York

Company

A 20% Saving in Cost of Explosives

FOR every 100 lbs. of Gelatin Extra 35% that is replaced cartridge for cartridge with Hercomite 3, there is a saving of between 20% and 25%—close to \$2.90 per 100 lbs.

And Hercomite 3 is successfully replacing Gelatin Extra 35% in many mines, quarries and construction operations. It has a cartridge strength of approximately 43%. Like all the Hercomites 2 to 7 it is insensitive to flame, shock, friction, and impact; is manufactured on the latest, improved low-freezing formula and represents a distinct forward step in explosives manufacture.

Savings of from 10% to 30% can be made by replacing the Gelatin Extra and Extra L. F. Powders, of 20% to 50% strength, with one of the Hercomites. The table below shows the grades of Extras and Gelatins which the new Hercomites should replace cartridge for cartridge.

HERCOMITE 2 is nearest grade to	{ 60% Extra L. F. or 40% to 50% Gelatins
HERCOMITE 3 is nearest grade to	{ 50% Extra L. F. or 30% to 35% Gelatins
HERCOMITE 4 is nearest grade to	{ 40% Extra L. F. or 25% to 30% Gelatins
HERCOMITE 5 is nearest grade to	30% Extra L. F.
HERCOMITE 6 is nearest grade to	25% Extra L. F.
HERCOMITE 7 is nearest grade to	20% Extra L. F.

THE number of 1¼" x 8" cartridges to the 100 lbs. in the Hercomites ranges from approximately 240 for Hercomite 2 to 350 for Hercomite 7. The weight strength is about 70% for Hercomites, and the bulk strength, or cartridge strength, varies with the cartridge count from approximately 20% for Hercomite 7 to 50% for Hercomite 2.

The Hercomites are similar in type to the popular Hercules Specials, except that the weight strength is greater. They are suitable for both underground and surface work. We recommend their consideration to the explosives consuming industries. They are suitable for a wide range of work, and wherever suitable they cut costs. Complete information and prices gladly furnished on request.

HERCULES POWDER COMPANY (INCORPORATED)

Sales Offices: Allentown, Pa., Birmingham, Buffalo, Chattanooga, Chicago, Denver, Duluth, Hazleton, Pa., Huntington, W. Va., Joplin, Mo., Los Angeles, Louisville, New York City, Norristown, Pa., Pittsburg, Kan., Pittsburgh, Pottsville, Pa., St. Louis, Salt Lake City, San Francisco, Wilkes-Barre, Wilmington, Del.

Hercules Powder Company, Inc.

934 King Street, Wilmington, Delaware

Please send me additional information regarding the new Hercomites, No. 2 to No. 7.

Name _____

Company _____

Street _____

City _____

State _____

Let us quote you on your timber requirements

WE specialize in WOLMANIZED mine props, logging, ties and shaft timbers as well as timbers for all structural purposes.

Wolmanizing has become standard practice in Europe where it has been practiced for nearly twenty years. It is even practiced in the mines of one of the largest creosote producers in the world—the former Hugo Stinnes Works.

Its sound economy is based on its high preservative value, cleanliness, and fire resisting qualities. Our quotation on your timber needs may prove to be a big source of operating economy.

AMERICAN LUMBER & TREATING CORP.

1138 Lake Shore Drive, Chicago

WOLMANIZED TIMBER

For crosscuts and drifts - - -



many operators have decided that the use of HOAR SHOVELS provides a satisfactory solution of mucking problems.

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Write us for full details regarding the application of HOAR SHOVELS to your work.

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MILWAUKEE, WISCONSIN. U.S.A.

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that
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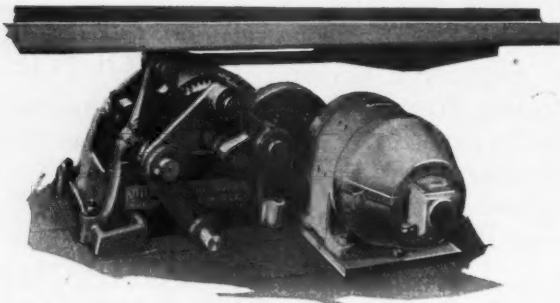
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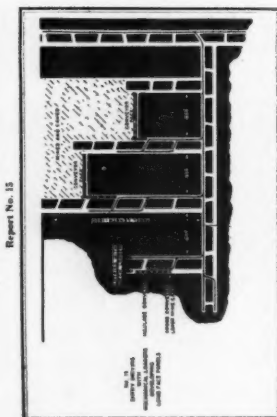
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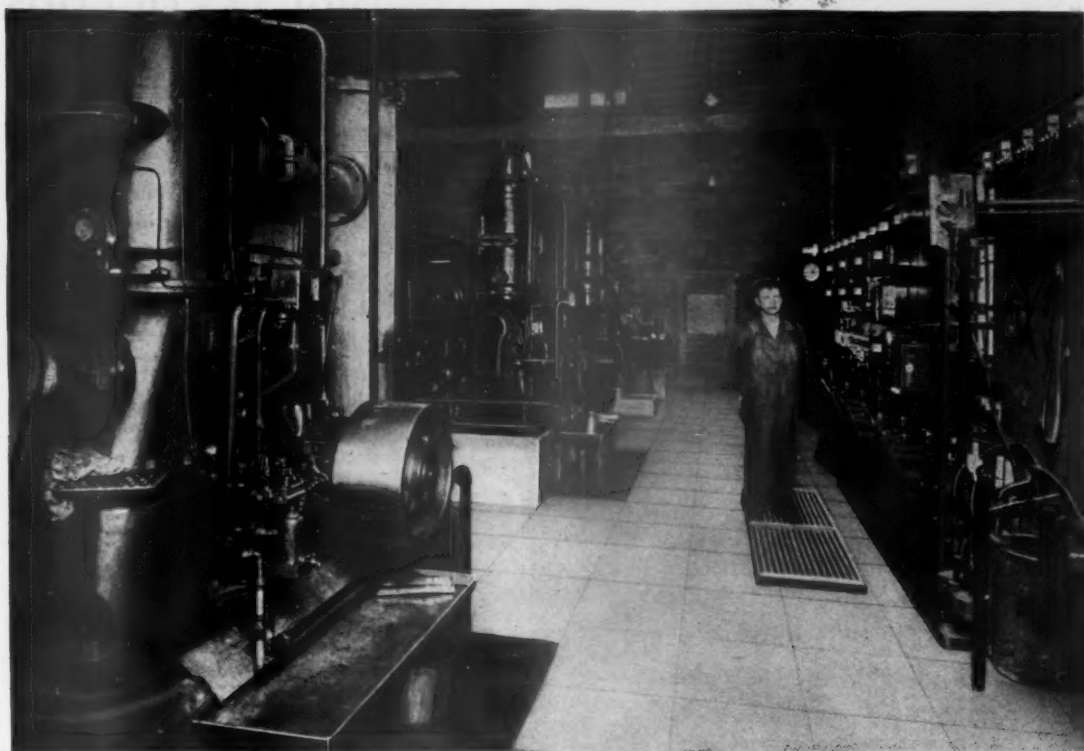
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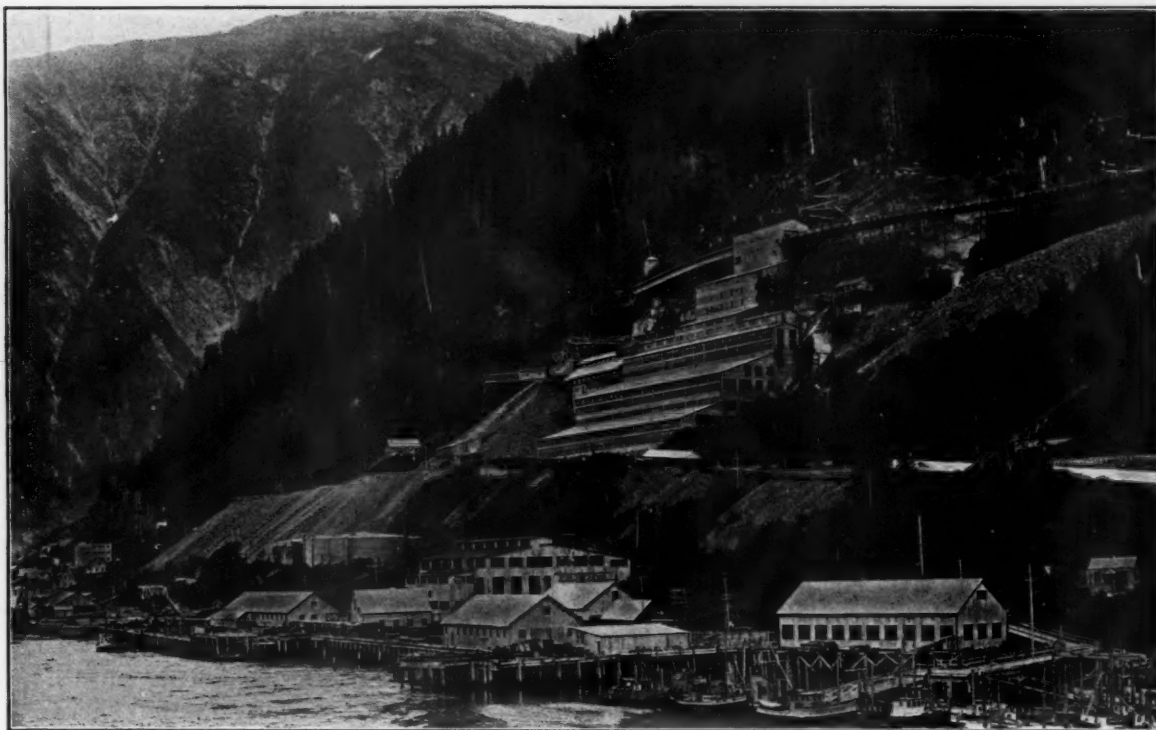
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Recently a powder drift blast using 21,000 pounds of du Pont 40% Red Cross Extra filled one of these cavities and a large pit



REG. U. S. PAT. OFF.

with 3,000,000 tons of gold ore. The descriptions under Figures 1 and 2 explain the details of this giant gold filling.

The blast actually broke out 250,000 tons and loosened over 3,000,000 tons, using only .045 pounds of powder per ton of ore broken.

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FIGURE 1—(At the right)

This large blast was located in the middle of a pillar 80 feet wide and 200 feet long which separated No. 2 open pit from No. 3 stope and gave support to it at one end. A fault, nearly vertical, made up a part of the other end of the stope, while a strike formed its footwall.

No amount of natural caving took place because of the strength and toughness of the metagabbro and slate in which the ore occurs.

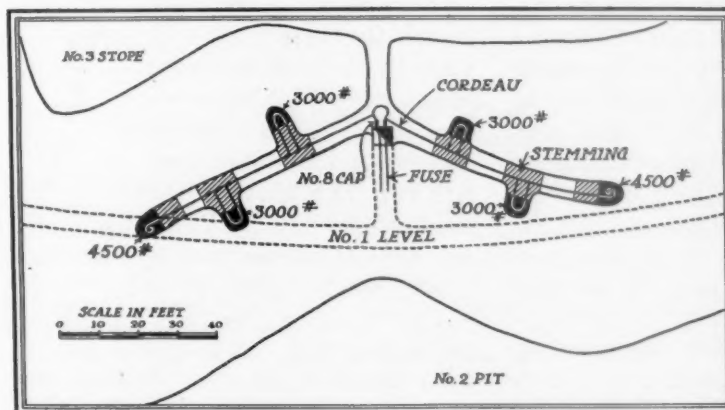
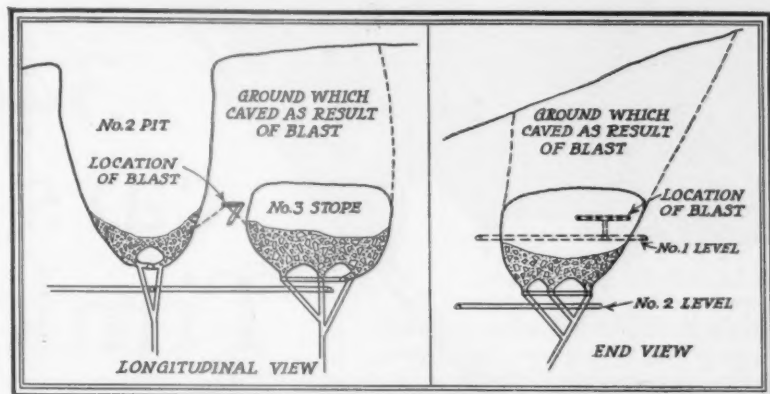
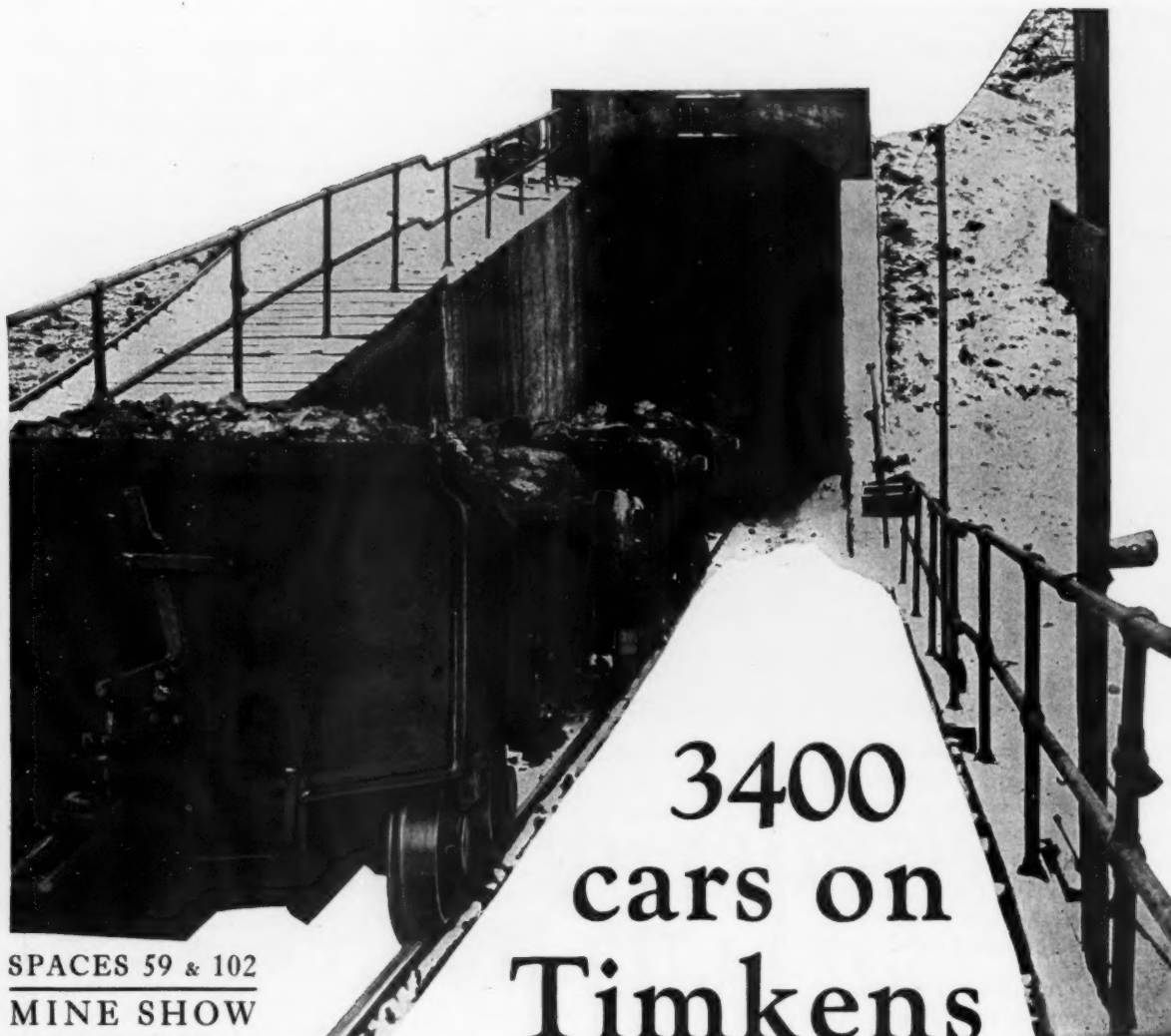


FIGURE 2—(At the left)

A powder drift was driven 65 feet each way from the top of raise 40 feet above No. 1 level, south. The powder drifts were driven about parallel with the axis of the pillar so that the burden averaged 40 feet. Six piles containing an average of 3500 pounds of du Pont 40% Red Cross Extra dynamite were packed tightly against the solid rock. One charge was placed in each face while the other occupied 10-foot spurs spaced equidistant along the drifts.

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TIMKEN *Tapered* Roller BEARINGS

The MINING CONGRESS JOURNAL

A Monthly Magazine—The Spokesman For The Mining Industry—
Published By The American Mining Congress

VOLUME 14

APRIL, 1928

NUMBER 4

Editorials

Tax Reduction

INCOME returns and taxes paid on March 15 indicate that there will be an ample surplus to justify the administration's tax reduction program of \$225,000,000. And it appears that this cut is possible notwithstanding the appropriations made and to be made by this Congress. This is certain to promote continued prosperity, and will benefit the country in many ways. It shows good business management of the nation's finances, and further justifies the confidence of the people in the fiscal policies of the Treasury Department under Secretary Mellon.

With respect to the general revision of the revenue law begun by the House in the bill passed by that body in December, there is so much question about the changes proposed in the administrative provisions, that it would not be surprising if the Senate would confine the revenue measure to tax reduction, leaving the matter of general revision to the next Congress after the Joint Committee on Internal Revenue Taxation has completed its studies and investigation of the entire income tax system. This would please most taxpayers, and would undoubtedly result in a better law than that now pending.

THE MINING CONGRESS JOURNAL favors the proposed cut of \$225,000,000. This should be made at once. But if the Senate Committee on Finance should decide to postpone the proposed general revision of the revenue laws, it is believed such action would meet with widespread approval. Amendments to existing law that seem necessary can be made without a general revision bill, and such a program will not meet with serious opposition from any source.

The Presidential Year

THE possibilities of what is known as the "presidential year" are unlimited. Its advent is the cue for the opposing political faction to advance its rights, present the shortcomings of the party in power and for that party to defend itself as it may. Industry is frequently made the football of politics in such a year, and the campaign of 1928 bids fair to take its place well to the fore in the record of troublesome presidential years.

If the rank and file of politicians are really as bad as they are painted; if we as a country are even remotely as sullied as we are represented by the political opportunist and the loose-thinking press, we would soon cease to exist as a nation; nor would we have any right to so exist.

But the truth of the matter is that we are no worse than we have been in other presidential years. Industry generally is better off than it has been in peace-time

periods. Labor is generally better employed and at better wages. The Income Tax Bureau reports a larger return for the year, incontrovertibly proving our prosperity.

And in spite of politics, the sun continues to shine on us as a favored nation. The travail of political campaigns cannot touch us except in a slight soiling of our country's garments as it passes.

Occupying The Limelight

THE so-called coal investigation is occupying the limelight. We use the word "investigation" reluctantly, and are inclined to substitute "prosecution" as more aptly depicting the strange proceedings on Capitol Hill. It is an unusual spectacle and would be amusing, were it not so serious, to see the dignified Interstate Commerce Committee of the Senate turned into a prosecuting attorney's office, impelled by political motives to make much out of little and to at all odds convict the prosecuted.

Powers and Immunities of the Senate

IN TIMES past Congress has frequently protested because of some acts of the executive which tended toward destruction of the powers of Congress and the Department of Justice. At times protest has been raised over the alleged attempts of Congress to usurp the prerogatives of the executive. At all times there has been a protest on the part of a certain class of people against the power of the courts in its determination of the constitutionality of certain laws enacted by Congress.

It is well that the American people shall be at all times on guard against the usurpation of any prerogative belonging to anyone of the divisions of government by any other division.

Just at this time the Senate of the United States is exercising a function which to the lay mind seems more like the functions which belong to the Department of Justice and which are ordinarily carried out through the agency of its prosecuting officers. In the courts, precedents have been established through which the individual may protect himself against insult and abuse. The legislative bodies under the Constitution are made immune "for any speech or debate in either House they shall not be questioned in any other place."

This particular protection of its legislators by the Constitution should and did for many years have the effect of inspiring on the part of its members a dignity which during recent times has more or less departed, particularly from the upper body of Congress.

The effort of the United States Senate to descend from its dignified position to that of a sleuth and prosecutor.

to perform services for which it is not equipped, and to assume the functions of the Department of Justice which is equipped to carry on these investigations, in our judgment, is creating a dangerous precedent and one which will not be approved by the people of the United States when once the tendency toward departure from constitutional design shall become apparent.

Establishing a Reputation

JUST how far afield the reputation of the Coal Investigating Committee has spread, and with what effect upon public opinion, was evidenced by one of the statements made to the committee by Charles M. Schwab, but just returned from an extended trip abroad, when he said, "I was afraid of you fellows before I got here; I was told that you would give me the devil." The dignity of the senatorial toga dragged into the dust; one of the highest offices in the land cheapened by some of its representatives who prefer political capital to respect for the office they hold!

Mr. Schwab made an excellent witness. He has a record for accomplishment that any Senator would be proud to own. His very position and record entitle him to respect of his fellow-citizens. But he was forced again and again to remind the committee that "we can get nowhere through antagonism." * * * "Let's go at this thing in a friendly spirit." Mr. Schwab's suggestions concerning the proper relationship which should exist between employer and employe were wholesome and sensible, and he backed them up with a record of more than 40 years of peaceful negotiation.

A Helpful Hand

OUT of the mass of recrimination, of prosecution, of biased testimony, so far recorded by the coal investigation, at least one sound suggestion has been put forth. Mr. Schwab pointed out with apparent pride the fact that his company paid all of the thousands of men in its employ during the year 1927, an average wage of 63.8 cents per hour—the highest annual average in the history of his company.

This statement is particularly interesting in view of the fact that this wage rate is about the same level of wages which the Pittsburgh and Ohio coal operators are now paying to their miners on a non-union basis, and against which bitter protest is being made by the United Mine Workers, the protest taking the form of the conditions which the committee is investigating.

The Bethlehem Steel Company was a pioneer in the field of cooperation between employer and employe. Their plan of operation, which is commonly referred to as the "Company Union," has been eminently successful. It has developed friendly relations which has led to settlement of all disputes by the parties immediately involved, and never once have they been forced to use their emergency valve, provided for in the agreement, to refer unarbitratable disputes to the Secretary of Labor.

This record of achievement stands boldly and solidly in relief against the frenzied background the union is trying to create.

The Mine Union's Part

THE coal investigation was ostensibly undertaken by the committee to work out some solution of the problems of the coal industry, with its labor situation occupying the limelight.

That it was instigated by the Miners' Union no one will deny. That it is being conducted by the union is an accusation well sustained by the record. That the

union of the miners was in a bad way is a well-known fact. It had occupied an untenable position almost to the point of its own destruction. It was obvious for months that the trump card of John L. Lewis was the politician. How effective a showman he is was not fully realized. George H. Cushing, in his weekly survey, paints a most vivid picture of the Lewis strategy:

"Lewis staged a show on the hillsides of Pennsylvania in midwinter. He housed idle men in board shanties. They wore thin clothing. The men did not have to stay there. They did not have to remain idle. They did not have to live in board barracks. They did it for show—a spectacle to background Lewis' failure as a labor leader. He sought to glorify his disgrace—turn it into a vast appeal for senatorial help. So he invited some soft-headed Senators out to see his 'monument.' The Senators went. The Senators wept. The Senators started an 'investigation.'"

Who Is Responsible

WHO is responsible for the misery that admittedly is in the coal fields? The state of Pennsylvania? The city of Pittsburgh? The Pittsburgh Coal Company? The latter is the target for all the arrows and, whatever its responsibility, it is, to say the least, the goat. Admitting the Pittsburgh Coal Company is in reality the cause of all the distress—how could it have remedied the situation?

Suppose you are the father of a number of daughters (we use the female persuasion advisedly for sympathetic reasons). You give to them the best you have. They demand more. They bring outside pressure on you to force you into giving them more. You mortgage your home, all of your property, in order to meet their demands. But the demands are ever increasing, and you face bankruptcy or a new plan of operation. Bankruptcy can help neither you nor them so you ask them to help you by accepting a scale of living that will permit you to redeem yourself. But they are adamant, and rather than accept what you can offer them, leave their home and choose to shame you by living in filth and dire poverty. They refuse to work. They place themselves in a position to invite crime and immorality. And what is more, they invite the yellow press to observe their situation and put all the blame on a greedy father who will not accept his responsibilities.

It is a sad story. The situation is deplorable. But who is to blame? The father? The local government? The state? The nation at large?

No one is stopping the miners in the Pittsburgh district from working. They are deliberately choosing to permit their families to suffer, to live in squalor. All their cries of "no backward step" and "for a principle" are trivial, when those same principles impel them to let their women suffer, their children go hungry, and their minds become a storehouse of hatred and blindness to their moral obligations both to family and country.

Proving the Obvious

THE Coal Committee is spending much time to prove conditions which everyone admits; to prove the existence of misery which one may safely predict as certain to exist wherever any considerable number of men are out of work for any length of time. The fact that they are out of work voluntarily apparently is beside the point in this investigation. The condition does exist. What is the remedy? Thus far the committee has not shown much ingenuity in bringing out the reason for this want and misery. Let us hope that before the hearings are concluded that the real reasons will be made manifest.

The Function of the Police

MUCH criticism has been directed to the activities of the coal and iron police, and the fact that their employment has been cited as evidence of brutality on the part of the coal operator. More criticism has been centered against the use of injunctions.

The purpose of the police is protection, and few will deny that without this protection destruction of life and property would have been enormous. History bears out that statement, and we have no evidence that will lead us to believe in a change of the principles that have actuated unionized terrorism.

The purpose of injunctions has been solely to protect the property of the operators from destruction and the men whose family responsibilities were such as to induce them to be loyal to their wives and children by accepting employment at a wage which would enable a company to operate and to pay wages at all.

Mexican Immigration

IN OUR March issue we stated editorially that "Serious curtailment of American business and loss of prestige in the Latin-American countries will result from the application of quota restrictions to immigration from countries of the western hemisphere similar to those applied to European countries." We pointed out that freedom of residence and travel throughout the western hemisphere for citizens of the United States is essential to the welfare and continued prosperity of this country. These statements are confirmed by the testimony of Secretary of State Kellogg before the Senate Committee on Immigration, March 5. Secretary Kellogg, after reviewing the entire situation, said:

"A tangible disadvantage to be expected as a result of the ill feeling in the countries of Central and South America against this country occasioned by the imposition of quota restrictions on them would be in the matter of retaliatory measures restricting and limiting the entry of American citizens to their territory. Serious harm to the important American interests in these countries could not but result from such measures, and this Government, having taken the initiative, would not be in a position to make any representations nor could it hope to succeed in any endeavor to limit such restrictions to the scope of those imposed by this country.

"The American interests in countries of this hemisphere, which would be exposed to injury if legislation should be adopted antagonizing the other American governments, are very great. According to an estimate received from the Finance and Investment Division of the Bureau of Foreign and Domestic Commerce, Department of Commerce, American investments in Canada and Latin America comprise approximately 66 percent of the total foreign investment of the United States.

"Our total private investments in all the world is \$12,000,000,000; our estimated investments in Latin America and Canada is nearly \$8,000,000,000; in fact, we have the largest trade with South America of any country in the world. Our merchants go there, live there; our men travel there and they receive the greatest courtesy * * * The volume of American business in and trade with the American countries form such an important part of the commercial life of this country that any state of affairs adversely affecting it would not but affect the general economic situation and prosperity of the United States."

We believe it was clearly demonstrated at the hearings by the numerous witnesses who appeared in oppo-

sition to the proposed immigration measures, that no reason exists for extending quota restrictions to the closest neighbors of the United States arising from the nature or volume of the immigration from those countries. On the contrary, it appears that such action would result in serious disadvantages to the United States, threatening not only Pan-Americanism, but jeopardizing our favorable relations with Mexico and other countries of Central and South America where we have the largest trade of any country of the world.

An Important Program

THE program for the Fifth Annual Convention of practical coal operating men just has been released by the committee of sixty operating men who have been cooperating in its preparation. The result is well worth while. It insures the presentation of the major operating problems of the coal industry by men who are successfully meeting them. It covers a wide field, and yet condenses its subjects to eight sessions. While the whole scale of operation comes in for attention, the program has been so coordinated as to give each subject the greatest advantage, and at the same time conserve the time of the men who attend the convention.

Mechanization A Feature

A FEATURE of the Cincinnati meeting will be three sessions for the discussion of the advancement of mechanized mining in the industry. The roll-call of states wherein a representative of each coal-mining state will show present development and progress made during the past year, supplemented by the report of the mechanization engineer of The American Mining Congress, who has made a 15 months' study and survey of the subject, should show conclusively the results that have been obtained, through, and the possibilities of the mechanized mine. This one feature of the convention should be well worth the time and expense of a trip to Cincinnati.

Assuring Discussion

THE committee is to be especially congratulated upon its effort to expedite the presentation of the papers. It announces that a period of but 10 minutes will be occupied in presenting any main paper, which will be printed in advance of the meeting and placed in the hands of delegates. This assures the maximum of discussion of a subject, and the reading of detailed statements at leisure.

The New Hall

A FURTHER advancement in these Cincinnati meetings is the announcement of the convention management of the complete rebuilding of Music Hall where the sessions are held and the exposition staged. A meeting room will be provided which will be completely equipped with radio audification. This will eliminate one of the major objections of delegates to these meetings, and will enable the speaker to be heard throughout the meeting-room without difficulty.

Senatorial Privilege

AT THE moment there is much activity by members of Congressional committees as to the so-called contempt of the Senate. A leading daily recently gave the term a new meaning, by pointing out that if the Senate really wished to know anything about the subject, "it might learn a great deal by perusing the public press, although such action might, if it were

feasible, place a large majority of our adult citizens in jail!"

Many things have been adding to this attitude, and chief among them is the evidence that some Senators are using their senatorial robes to protect them in saying things that they would not dare say as citizens.

Just what did our forefathers mean when they established the right of senatorial privilege? Certainly not the right to besmirch the character of individuals unable to retaliate. Yet we are subjected to the sight of a Senator rising in his seat to declare that certain of our leading citizens are involved in shady procedure. The statements were apparently without foundation, and the accused are without redress. A Senator of the United States has spoken. Even the exigencies of politics do not warrant such action.

What are the limits? What protection has the man who, frequently by self-sacrifice, has risen to prominence in our country's service! Any citizen is protected against attacks on his integrity through redress in the courts, but he is not vouchsafed this same right when the attack comes through "senatorial privilege."

If such procedure is permitted to continue, it will become increasingly difficult to interest real leaders in the business of government.

Our Labor Policy

WE BELIEVE that the wage-earner should receive the highest wage possible for industry to pay. We believe that through high-wage scales the consumptive power of the country will be increased to that point where it can absorb enough of our domestic goods to keep all employed, and the wheels of industry in continuous operation. We do not believe that these conditions can or will be brought about by the demand of a minority outside the law, no matter how altruistic that minority may pretend to be.

We favor opportunity for all, the highest productive capacity of the worker, and his right to quit work individually, but not collectively in conspiracy against the industry he is serving.

The Lobby Bill

THE Senate has passed the lobby bill, which compels all those who would present industry's problems to the Congress to register their interest and intent.

The result will not be far-reaching. These agencies that represent the great industries of the country do not lobby. And industry does not present its voice individually, but collectively through the medium of its associations.

One of the leading Senators, an aspirant to the Presidency, recently remarked that the lobby bill only emphasizes the attitude of our Congress, that Senators and Congressmen do not need information. "They already know all about everything. They are blessed with some sixth sense that enables them to see clearly both sides to all controversies. They are a body of super-men."

Seriously, however, both houses of Congress welcome dependable information. It helps them to arrive at an honest conclusion. They have learned in their years on the hill who to depend upon, who to go to for information, and they frankly avail themselves of that information.

All legislation along this line will have little effect on industry or Congress.

Adjournment of Congress

THERE is now every indication that Congress will adjourn early in June. There is much for individual members to do at home, and the major legislative problems give promise of easily being out of the way before that date. For a time it seemed that the investigation-mania would lead to an extension of the closing date, but there is reason now to believe that this phase of Congressional action is at its peak, and that no new investigations will be started, although a record number of resolutions proposing them has been achieved at this session.

At the moment the major investigations occupying the time of Congressional committees are oil (now four years old), cotton and coal. The Walsh utility investigation was transferred to the Federal Trade Commission, and the suggestion for inquiry into brokers' loans, and the Nicaraguan situation, appear to be dead.

Public opinion is beginning to be felt concerning investigations, with very definite indications of disapproval.

There apparently is nothing in the legislative situation that will keep Congress in session during the summer. Appropriation bills are going through fairly rapidly, and there is a general inclination to let bills which will precipitate controversy lie unacted upon.

Tax and flood control are the two big questions before the session now, and these, together with the help-the-farmer movement and routine business, should be disposed of in ample time to permit of the early adjournment now anticipated.

The Friend of the Laborer

IN A RECENT editorial the *Scientific American* states: "In view of the multiplied benefits conferred upon labor by the development of machinery, automatic and otherwise, it is difficult to realize that, in an earlier age, the working man looked upon the introduction of labor-saving machines with suspicion and in many cases fought it with riotous violence. It took time to teach the great truth that the labor-saving machine, so far from curtailing the demand for labor, greatly increased it."

But the job is not yet complete. There are still today many instances of the antipathy of labor to the introduction of the machine, and in no place has it been more marked than in the mining industry. But in spite of objection mechanization is the accomplished fact in many mines, and its growth is well assured by the results that are being attained through the application of machinery.

The National Industrial Conference Board states that the volume of production in 1923 was 33 percent greater per wage earner than it was in 1914; that it required 25 percent less labor, 13 percent less power, 17 percent less management personnel per unit of production, and 7 percent less actual working time per man than was necessary in 1914.

No one claims that the introduction of machinery is entirely responsible for this desirable result. Intelligent management has played a decisive part. But machinery is the helpful hand and tool of management.

An example of its importance to mining is demonstrated by the fact that more than one hundred manufacturers of mining machinery will exhibit their equipment at Cincinnati during the annual meeting of coal operating men. This equipment, worth many hundreds of thousands of dollars, will be staged in two great sections of the Exposition Building, and will present graphically the advancement of the industry in applying machinery to production.

Just Suppose

in favor of the Government control and operation of industry should become successful.

Just suppose that our vast railroad system became property of the Government. And that the coal industry likewise passed to the politician. And the public utility industry, and the mineral producing industries, to say nothing of the lumber industry and other sources of raw material supplies, were placed in the hands of Uncle Sam to operate in competition with the rest of industry.

The value of the railroads is estimated at approximately twenty billions of dollars. It is more difficult to ascertain the physical value of coal and minerals, but roughly they should aggregate at least fifty billions.

Withdraw seventy billions of taxable property from taxation, and add to it the payroll for the vast army of political workers, plus the deficit of operation, and the result is somewhat staggering.

If we seem to be exaggerating, an example of Government operation of industry might bolster up the situation. The flight of Government into the realm of shipping shows an astounding situation. The United States Shipping Board, operating for a 10-year period, shows a 500 percent turnover in its corporate members, with 11 presidents in that period of time; it created a deficit of \$3,571,000,000, and at the end of the 10-year period is still operating with an annual deficit of \$20,000,000.

Can such a travesty of executive incompetence be imagined in private industry? We may be ever so heartily in favor of a United States Merchant Marine, but certainly it has shown an astounding degree of incompetence under political management.

What is true today of Government operation of the merchant marine is but a repetition of each and every Government enterprise undertaken in competition with industry.

Just suppose we had the Shipping Board episode repeated in, say, half a dozen of our major industries. Can the result be contemplated with any degree of sanity?

Impossible? Yes, but JUST SUPPOSE!

A Wonderful Government

THE most striking commendation of the business machinery of the United States lies in the fact that we have escaped large unemployment during the period following the close of the war. At this time there is evidence of small unemployment in certain parts of the country, while other parts are short of labor.

The enormously increased productive capacity of the nation developed to meet war requirements through a comprehensive business system supported by a wise administration of public affairs, has postponed until now any indication of unusual unemployment. The net result of this increased productive capacity has been to make available to the people as a whole increasing luxuries in addition to the necessities of life.

That philosophy which has opposed increased labor-saving devices in order that the wage earning class might not be deprived of employment has been shown to be utterly fallacious. Every new invention looking to greater comfort or amusement has led to a new business development calling for the utilization of the many men who have been thrown out of employment in some other line.

Our Government is now on the home stretch of the

JUST suppose that the yawping minority that is constantly making so much noise

most difficult task ever faced by any government in the history of the world. The World War called for the feeding and clothing of millions of people in foreign countries, including four million of our own soldiers, withdrawn from our production power, to supply the enormous wastes of war and at the same time meet our normal task of feeding and clothing our own people. It required us to more than double the ordinary productive capacity of the nation. When these super demands came to an end, our production machinery had to be slowed down almost one-half and, at the same time, employment for the four million returning soldiers had to be provided. We have passed through these years of readjustment without a panic, and without any really serious unemployment.

We might have expected a financial crash, the greatest of history. We might have expected that at least one-half of the war production machinery would be permanently idle and millions of workers unemployed and starving.

Do we appreciate the wonderful government which has led us unscathed through these trying conditions? Do we appreciate the wonderful business organization which has carried on in making these readjustments possible? We are not through but we are almost through this trying task, and if politicians can be induced to quit rocking the boat we shall in the near future have finished without undue suffering the most intense national job ever undertaken in the history of civilization.

Scientific Prospecting

AMONG the bills which are under consideration by the Senate of the United States, is one introduced by Senator King of Utah, intended to provide for the location of mineral bodies which do not outcrop upon the surface and of which a visual discovery is impossible except as the result of the expenditure of large sums of money.

This bill is designed to make possible the practical utilization of the new rapidly developing geophysical methods of prospecting. THE MINING CONGRESS JOURNAL has carried from time to time discussions of this newer application of science, and the mining industry as a whole is intensely interested in the higher development of this science and in so adapting our land laws that the benefits of its indications may be practically applied.

As most of our readers know, the present law requires that actual discovery of minerals in place is required to provide patent for a lode claim under our mineral land laws. Within the limits of the United States the ground has been pretty thoroughly prospected for surface deposits.

It is not believed that all of the mineral or any considerable part of it outcrops upon the surface. Prospecting below the surface by core drilling has resulted in the location of many ore bodies within a few hundred feet of the surface and in locations where every geological indication pointed to the existence of ore bodies.

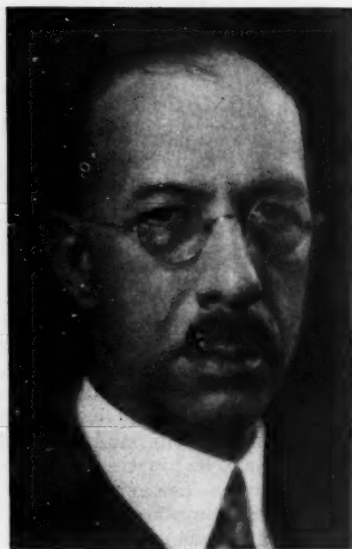
By the scientific methods of prospecting now being developed, it is believed that it will be possible to locate bodies of minerals at depths which would make discovery as defined by our present laws impossible, and yet no operator would be justified in the expense necessary to open up a body of ore at great depth below the surface, except under legal provisions which would entitle him to the ownership of that ore body when finally developed.

The bill now under consideration is a step in the right direction and whether it fully covers the situation or not is a question which should have careful consideration by the mining men of the Rocky Mountain states.

ANNUAL MEETING COAL OPERATING OFFICIALS

THE Fifth Annual Convention of Practical Coal Operating Men to be held at Music Hall, Cincinnati, Ohio, during the week of May 7, gives promise of being the most outstanding of any of the very successful meetings yet staged under the auspices of the Manufacturers Division of The American Mining Congress. This applies with equal force to the program, the exposition and the attendance.

For some two months 60 coal men, representing every coal-producing district in the United States, have been



L. E. Young, Chairman of Program Committee

engaged in developing a program of unusual merit. They have just released their preliminary program, and will release the completed program within two weeks. The Program Committee, headed by Dr. L. E. Young, vice president, Pittsburgh Coal Company, Pittsburgh, Pa., is composed of the following representatives:

Alabama—D. J. Carroll, Woodward Iron Company; Frank G. Morris, Republic Iron and Steel Company; Erskine Ramsay, Alabama By-Products Corporation; G. L. Chamberlain, Southern Coal and Coke Company; D. A. Thomas, Montevallo Coal Mining Company.

Arkansas—Heber Denman, Paris Purity Coal Company.

Mechanized Mining Feature Of Program, Which Also Gives Special Attention To Problems Of Management — Exposition To Display Equipment Of More Than One Hundred Manufacturers

Colorado—D. R. Stout, Colorado Fuel and Iron Company; F. W. Whiteside, Victor American Fuel Company.

Illinois—Dr. E. E. Fyke, Marion County Coal Company; Ralph D. Brown, Brewerton Coal Company; Carl Lee, Peabody Coal Company; Geo. B. Harrington, Chicago, Wilmington and Franklin Coal Company; J. D. Zook, O'Gara Coal Company; G. E. Lyman, Madison Coal Corporation; D. D. Wilcox, Superior Coal Company.

Indiana—W. J. Freeman, Fayette Realty and Development Company; David Ingle, Ayrshire Coal Company; Hugh Shirkie, Shirkie Coal Company; Robert J. Smith, Deep Vein Coal Company; Carl J. Fletcher, Old Knox Mining Company; T. C. Mullins, Sunlight Coal Company; Earl Oliphant, Standard Coal Company.

Kansas-Missouri—W. C. Shank, The



J. G. Bradley, President, The American Mining Congress

Carbon Coal Company; Erle S. Ormsby, G. M. Donk Bros. Coal and Coke Company; W. K. Kavanaugh, Southern Coal and Coke Company; C. C. Wilcox, St. Louis and O'Fallon Coal Company.

Kentucky—T. E. Jenkins, West Kentucky Coal Company; R. E. Galbreath, Wisconsin Steel Company; W. M. Pearman, Edgewater Coal Company, Inc.; F. C. Mahan, Harlan Coal and Coke Company.

Maryland—G. M. Gillette, Consolida-



H. K. Porter, Chairman, Manufacturers Division, The American Mining Congress

tion Coal Company; Dr. J. J. Rutledge, State Bureau of Mines.

New Mexico—W. D. Brennan, Stag Canon Branch, Phelps Dodge Corporation; C. T. Griswold, A. T. and S. F. Ry. Co.; O. Huber, Albuquerque and Cerrillos Coal Company.

Ohio—Ezra Van Horn, Clarkson Coal Company; W. L. Robison, Youghiogheny and Ohio Coal Company; R. L. Ireland, M. A. Hanna Coal Company; E. L. Thrower, Warner Collieries Company; E. J. Christy, Wheeling Township Coal Mining Company.

Pennsylvania—Geo. F. Osler, Pittsburgh Terminal Coal Company; Frank Dunbar, Hillman Coal and Coke Com-



E. A. Holbrook



Eugene McAuliffe



W. L. Robison



A. C. Callen

pany; T. F. McCarthy, Clearfield Bituminous Coal Corporation; B. H. Stockett, Chas. M. Dodson and Company; A. B. Kelley, Humphreys Coal and Coke Company; J. B. Warriner, Lehigh Coal and Navigation Company; Floyd G. Wilcox, West End Coal Company; N. G. Alford, H. N. Eavenson and associates; C. Law Watkins, Pennsylvania Coal and Coke Company; E. J. Newbaker, Berwind-White Coal Mining Co.; Dr. L. E. Young, Pittsburgh Coal Company; Percy C. Madeira, Madeira, Hill and Company; T. R. Johns, Bethlehem Mines Corporation.

Tennessee—C. E. Abbott, Tennessee Coal, Iron and Railroad Company; G. S. Jones, Ohio Collieries Company.

Utah—Geo. A. Schultz, Liberty Fuel Company; Walter F. Clarke, Independent Coal and Coke Company; D. D. Muir, Jr., U. S. Fuel Company.

Virginia—Geo. W. Craft, Pocohontas Fuel Company; Lee Long, Clinchfield Coal Corporation; H. S. Estill, Stonega Coal and Coal Company.

West Virginia—Humphrey D. Smith, Ashland Coal and Coke Company; F. S. Follansbee, Melcroft Coal Company; Edward Graff, The New River Company; A. R. Beisel, Island Creek Coal Company; Jay I. Snoderly, Bethlehem-Fairmont Coal Company; Harry Gay, Jr., Gay Coal and Coke Company; Arthur Downing, Monitor Coal and Coke Company; Thomas Clagett, Pocahontas Coal and Coke Company; Thomas G. Fear Consolidation Coal Company.

Washington—E. P. Lucas, Bellingham Mines Company.

Wyoming—A. W. Dickinson, Union Pacific Coal Company; Edward Bottomley, Sheridan-Wyoming Coal Company; Glen Knox, Gunn-Quealy Coal Company.

The program will occupy eight major sessions, each devoted to a specific subject. Problems of Management and Safety will be discussed at the opening



A. B. Kelley



J. B. Pauley

session; Power and Transportation, Coal Cleaning, Successful Mechanized Mining Operations, and Cutting, Shearing, Snubbing and Blasting, will be discussed in the order named at subsequent sessions.

The committee has attempted to economize upon the time of the operating official, by so arranging the discussions that the various members of a company may attend the convention and return with a minimum of time away from the mine.

Sessions will be presided over by A. C. Callen, University of Illinois; Dean E. A. Holbrook, University of Pittsburgh; Dr. L. E. Young, Pittsburgh Coal Company; J. A. Pauley, Miami Coal Company; Eugene McAuliffe, Union Pacific Coal Company; A. B. Kelley, Humphreys Coal and Coke Company, and G. M. Gillette, Consolidation Coal Company.

Papers to be presented to the convention, so far announced by the committee, are as follows:

The Training and Selection of Personnel, by H. S. Gilbertson, Lehigh Coal and Navigation Company; General Underground Supervision, by H. A. Treadwell, Chicago, Wilmington and Franklin Coal Company; Advancement in Rockdusting, by Charles Enzian, Berwind-White Coal Mining Company, and J. E. Jones, Old Ben Coal Corporation; Safety

Equipment to Prevent Accidents, by D. Harrington, the United States Bureau of Mines. These papers are to be presented at the opening session when Management and Safety Problems will be discussed.

On Tuesday morning, May 8, Power and Transportation will occupy the time of the convention, and the following papers have been announced for this session: Capacity and Design of Mine Cars by C. E. Watts, Berwind-White Coal Mining Co.; Results Obtained Through System for Mine Locomotives, by Roy Adams, Old Ben Coal Corporation; Reducing the Power Bill, by Jas. A. Erskine, Monongahela Coal Operators Association; Pumping at the Philadelphia and Reading C. & I. Co., by J. T. Jennings; Supplying Power Through Automatic Sub-stations, by W. C. Shunk, Stonega Coke and Coal Co.

Two sessions of the convention will be devoted to coal cleaning, and the following papers have been announced: The New Coal Cleaning Plant of the Berwind-White Coal Mining Company, by E. J. Newbaker, General Manager of the company; Coal Cleaning at the Tennessee Coal, Iron and Railroad Company, by C. E. Abbott, manager of mines of that company; General Principles of Coal Cleaning, by J. B. Morrow, Pittsburgh Coal Company. Other papers for these sessions will be announced shortly. The committee has developed the sessions to cover three phases of the problem—Coal Washing, Dry Cleaning and General Tipple Practice. This feature of the program is being developed by a sub-committee of the main program committee, the personnel of which is A. B. Kelley, Humphreys Coal and Coke Company; E. J. Newbaker, Berwind-White Coal Mining Company, and Newell G. Alford, consulting Engineer of Pittsburgh, Pa.

Successful Mechanized Mining Operations will occupy three sessions of the

convention. An especially interesting program has been arranged. The opening session will attempt to show the extent to which mechanized mining has been adopted in this country. G. B. Southward, mechanization engineer of the American Mining Congress, who has spent the past 15 months in an investigation of this subject, will report his findings. Dr. L. E. Young, chairman of the Program Committee, and chairman of the Mining and Loading Section of the Standardization Division of the American Mining Congress, under whose auspices Mr. Southward has conducted his investigation, will preside at this session, and will present his view as to the possibilities of mechanical mining.

Roll call by states, to show present development of mechanized mining and progress made during past year is as follows:

Alabama, Erskine Ramsay; Arkansas and Oklahoma, Heber Denman; Colorado and New Mexico, D. A. Stout; Illinois, E. E. Fyke; Indiana, David Ingle; Kentucky, T. E. Jenkins; Maryland, G. M. Gillette; Montana, H. S. Hopka; Ohio, E. J. Christy; Pennsylvania, western, N. G. Alford; central, C. Law Watkins; anthracite (to be selected); Utah (to be selected); Virginia, Geo. M. Thorn; West Virginia, southern, Thos. H. Clagett; northern, Jay I. Snoderly; Washington, E. P. Lucas; Wyoming, A. W. Dickinson.

J. A. Pauley, Miami Coal Company, will act as chairman for the second session on mechanized mining when the discussion will center around Entry Development, and Room and Pillar Mining, with the following papers to be presented:

Entry Development with Mechanical Loaders, Jerome C. White, Pittsburgh Coal Co.; Entry Development with Shaker Loaders, Geo. B. Pryde, Union Pacific Coal Co.; Entry Development with Pit Car Loaders (to be selected); Entry Development with Entry Drivers, by representative, Chicago, Wilmington and Franklin Coal Co.; Mechanical Loaders in Entries, Rooms and Pillars; Mechanical Loaders in Entries and



H. A. Buzby, First Vice-Chairman



C. L. Herbster, Second Vice-Chairman



F. J. Maple, Third Vice-Chairman



J. C. Wilson



N. S. Greensfelder
Honorary Chairmen

Rooms, J. R. Henderson, Francisco Coal Co.; Conveyors in Entries, Rooms and Pillars, F. B. Dunbar, Hillman Coal and Coke Co.

The third session of the Mechanized Mining Section of the program will be presided over by Eugene McAuliffe, Union Pacific Coal Company, with the program being divided into three sections: Long Face Mining, Rock Work with Mechanical Loaders, and Mechanized Mining in the Anthracite Industry. The following papers have been announced, and the committee expects to make further announcement of additional papers shortly:

Mechanical Loaders in Entries and Long Faces, by Lee Haskins, J. K. Derling Coal Company; Scrapers in Entries and Long Faces, by W. H. Smitherman, Wet Branch Coal Company; Conveyors on Long Faces, W. C. Snyder, Consolidation Coal Company; Anthracite mining (a) Conveyors in Rooms, (b) Scrapers on Long Faces, (c) Scrapers in Rooms; Rock Work with Mechanical Loaders, T. F. McCarthy, Clearfield Bituminous Coal Corporation.

Cutting, Shearing, Snubbing and Blasting will occupy the final session of the

convention, with G. M. Gillette, Consolidation Coal Co., presiding. The following papers will be presented:

The Use of the Carbon Dioxide Cartridge, by Paul Weir, Bell & Zoller Coal and Mining Co.; Recent Developments in Drilling Equipment and Practice, by Thomas W. Gray, and J. T. Clarke, Pittsburgh Coal

Company.

The committee is arranging for an additional paper at this session on Shearing, and one on Permissible Explosives.

All papers will be allotted 10 minutes in presentation. Papers will be printed in advance and distributed at the meeting. The author will present the highlights of the paper in the 10 minutes allowed, and it will then be open for discussion. A criticism of previous conventions is that too much time has been consumed in the presentation of papers. The committee believes that the plan they have inaugurated will do away with this criticism and that operating men will get more out of the sessions.

An added attraction for the entire convention is the new Music Hall. The building has been completely remodeled and is now one of the most up-to-date exposition and convention buildings in the country. All sessions of the convention will be held at Music Hall, in an especially constructed meeting room, which will be equipped with radio audification, assuring everyone in the room plainly hearing the speaker. This will eliminate what has been the most difficult problem of the convention management.

An effort is being made this year to leave as much time as possible for operators to inspect the exposition. The convention will not open until 2 p. m., Monday, May 7, but the exposition will be formally opened at 9 a. m. on this day. This will give delegates an opportunity to inspect the exhibits and to visit with their friends before the convention begins its work. The program has been cut down as far as possible to enable more free time, and still discuss all of the problems the various districts are anxious to have discussed. With (Continued on page 238)

The WORK of the NATIONAL SAFETY COUNCIL

By W. DEAN KEEFER*

WHILE there is no denying that entirely too many accidents occur in the mining industry and some operators aren't impressed with the vital importance of safety work, the conservation of lives and limbs is by no means being ignored by the owners. Today there are scores of earnest safety crusaders who are engaged in determined, aggressive, organized efforts to prevent accidents in mining operations, and that their perpetual campaigns are not without encouraging results is manifested by their records. There still remain, however, a large number of mining operators who have yet to be sold on the value of making accident prevention work an integral part of their production program. It was at these indifferent men that a prominent speaker directed his remarks during the Sixteenth Annual Safety Congress, which was held in Chicago last fall, when the Mining Section of the National Accident Prevention Institute presented a program which was indicative of the activity of that division.

In 1912, when Dr. Joseph A. Holmes, founder and then director of the U. S. Bureau of Mines, spoke on "Safety in Coal Mines," at the First Safety Congress, the industry was impressed with the sincerity of his address, and there followed the organization of the American Mine Safety Association, which later became the Mining Section of the National Safety Council. J. W. Paul, at a meeting held at Detroit in 1916, ad-

* Director, Industrial Division, National Safety Council, Chicago, Ill.



vocated the formation of standards on first-aid contest rules, mine-rescue contest rules, mine signs, danger signals, signaling codes, miners' lamps, and general safety rules. As a result of this

While The Work Of This Organization Covers All Industry, Its Activities In Promoting Safety In The Mines Is Particularly Interesting—Their Program, Their Purpose, And The Results They Have Obtained Discussed.

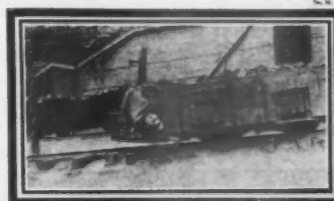
suggestion, working committees were organized and some excellent papers were prepared. The members adopted a sys-

tem of accident reporting, which has done much toward furnishing timely and valuable statistics. Under the leadership of B. F. Tillson, the section progressed to the extent that the Bureau of Mines and the National Safety Council cooperated in financing a paid secretary, who gave all of his time to the mining safety question. Although excellent work was done under this arrangement, it was not possible to raise the necessary funds with which to continue his activities.

Another result of the activity of Mr. Tillson was the preparation of two safe practice pamphlets, "Mine Rescue Training and Operation" and "Underground Mine Cars and Haulage," two excellent monographs on accident hazards and the best practices in their elimination, which have been revised to meet modern conditions and still are being distributed.

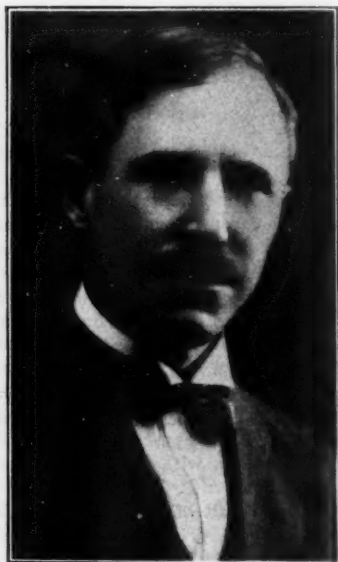
T. T. Read, secretary of the Mining Section, was the first editor of the *Monthly News Letter*, which was established in the fall of 1925, and was succeeded by Daniel Harrington, chief of the Safety Division of the U. S. Bureau of Mines, who is still editing this bulletin.

More than 125 papers relating to the prevention of accidents have been presented for the consideration of members of the section. These cover such subjects as industrial relations, safety propaganda, first-aid, rescue work, statistics, sanitation, drilling, hoisting, mine fires, explosives, explosions, transportation, ventilation, loading chutes, roof and ore



Types of safety posters issued by the National Safety Council





W. H. Cameron, Managing Director,
National Safety Council

falls, lighting, electrical apparatus, signs, coal breakers, washery and ore-dressing plants, and open pits.

To date the National Safety Council has issued for its members 260 posters on coal mining and 215 posters on metal mining. A new one is issued each month. In addition, scores of mining illustrations have appeared in the *National Safety News*.

The film slide service offered by the council includes approximately a hundred different pictures that are suitable for display in mining districts. The entire collection numbers 1,500 slides relating to industrial safety and some 500 on the prevention of accidents on the streets and highways, in other public places, and at home. There is no charge for the use of these slides except for transportation expenses.

Members also have the privilege of calling on the council staff of safety engineers, editors, and librarians for information and advice relating to accident prevention subjects. What is known as the council's million dollar library contains the most complete collection of safety literature, books, pamphlets, leaflets, magazines, clippings, and other data in the world. This fund of data is constantly growing.

The annual safety congress is the once-a-year meeting for all members. At this great gathering there is an average attendance of 5,000 accident preventionists not only from the United States but also from abroad. Members at the Chicago convention last fall heard more than 300 speakers, who addressed 104 different meetings, luncheons, sectional sessions, breakfast conferences, and the banquet, which was attended by more than 3,000 persons. The transactions of the 1927

gathering are now ready for distribution to persons interested in the work of the organization. Each member receives a complimentary copy.

Another feature of the council is the annual safety calendar, which is beautifully illustrated by reproductions of colored oil paintings. The pictures depict



Homer E. Niesz, President, National
Safety Council

the human side of safety effort and millions of them have been hung in shops, factories, offices, schools, and homes. On the reverse side of the illustrations the sheets contain pertinent and valuable information. Each member gets a copy of this calendar free of charge and additional ones are sold at nominal cost. Thousands of employers distribute their calendars among their employees.

In addition to publishing the *National Safety News*, the council issues two other



W. Dean Keefer, Director, Industrial
Division, National Safety Council

monthly periodicals—*Public Safety*, for people interested in preventing accidents on the streets and highways, in other public places, and at home, and *Safety Education*, for teachers and school children.

Today the membership of the National Safety Council includes 4,456 owners of mines, manufacturing establishments, public utilities, and other industrial firms, as well as educators, public officials, motor clubs, etc., and some 60 affiliated safety councils located in leading communities. The membership is divided into some 20 industrial sections, such as mining, metals, cement, railroads, marine, power press, taxicab, textile, petroleum, wood working, packers, and tanners, etc. The activities of these sections are directed by voluntary officers and committeemen, 1,000 of whom serve without financial compensation. At the headquarters office in Chicago there are 82 persons giving all of their time to the national safety movement.

Space will not permit details regarding the various forms of service rendered by the National Safety Council. In brief, the institute is a huge clearing house of information, distributing the accident experience information of members, on a cooperative, non-profit making basis. The council today is recognized as the leading institution of its kind in the world. In addition to serving its membership, the council conducts a perpetual educational campaign to impress upon the general public the importance of conserving lives and limbs and property on the streets and (Continued on page 232)

SAFETY

Apply brake from the wide
rib side of car



Trip rider may be caught and crushed
against narrow rib side



The SAFETY PROGRAM of the OLD DOMINION COMPANY

By I. H. BARKDOLL*

A Brief Outline Of The Safety Department Of This Company From Its Origin—Safety Engineer, Direct Interest Of Management In Plan, A System Of Bonuses And A Series Of Employee Committees Factors In System That Is Producing Splendid Results

THE Mine Safety Department of the Old Dominion Company was inaugurated January 1, 1914, by appointing a safety inspector for the underground workings for the purpose of preventing accidents. His duty was to make regular inspections and report on the condition of all traveling-ways, main exits, manways, shafts and such other places as used for emergency ways not frequently visited by others; to inspect all working places; to have the necessary precautions taken in all working places to avoid any accidents and make a monthly report of the conditions found. In the case of a serious or fatal accident on either the day or night shifts, he was notified and visited the place as soon as possible, made a thorough inspection of the conditions, collected all available information by getting the names of all the witnesses and a statement from each one regarding all conditions, so as to be able to make a full report of the accident.

At that time—and this will always be the case—it was necessary for the officials to take the lead in this movement. Warning and danger signs were posted throughout the mine; considerable work was done guarding the tops of all chutes and manways to prevent men from falling into them, which heretofore was the cause of many serious and fatal accidents. In most of the square-set manways staggered ladders were installed, and where the ladders were not staggered trapdoors were installed. Trap-

doors were also installed in all cribbed manways, the distance between them not to exceed 20 ft. All working raises, shafts and winzes at the height or depth of 50 ft. were supplied with blasting batteries, or switches connected to the electric light wires, and delay action fuses. Considerable improvements were also made pertaining to safety around the underground machinery.

To make this movement more successful, it was deemed best to get the shift bosses interested by explaining to them that improved conditions meant better work; by making it clear to them that they could perform no better service than that of showing an indifferent companion that it was his duty to perform the work in a systematic and intelligent manner and to use his brain as well as his muscles. They were made to see that they must recognize the men as human beings with responsibility placed upon them, and that they were to assume it.

To accomplish some of these objects a system of bonuses for the shift bosses based on their safety record was inaugurated. Each shift boss working 500 shifts or more per month without any lost-time accidents was given a bonus of \$10. If there was any time lost and it was less than 1 percent of the total

shifts worked, a bonus of \$5 was given. This proved very successful, as it encouraged them to watch their men more closely. Every shift boss was entitled to this bonus each month, regardless of the number of accidents in the previous month. In this way they all started out with a clean sheet at the beginning of each month. There was also a sheet composed each month with their names, number of accidents, lost time, etc. This made them more careful, because they did not care to see their names with a large number of accidents opposite it.

To get the men interested in the movement it was decided that three men should spend two days each in going through the mine with the inspector. After the first three men had gone through with the inspector for two days, they went back to their respective places and three more were taken. They were shown the different workings of the mine and the conditions in which they should be kept. Conditions were shown that would influence them to use their best judgment in keeping their own places in a clean and safe condition and try to prevent their fellow workmen from being careless.

While going through the mine they were invited to offer suggestions, call attention to anything they deemed necessary to prevent an accident, and ask questions. They were also encouraged to offer suggestions to their bosses whenever they deemed it advisable and to report to them anything they considered dangerous. The bosses were also in-

* General Manager, Old Dominion Company, Globe, Ariz.

structed to be very courteous whenever any suggestions were being offered. This proved very successful in educating the bosses and men along the lines of safety. Some of the men would go back and tell their bosses of the improved safety conditions in other runs, and the boss being keen to keep his run as good or a little better than the others, began getting busy. In most cases the men who had gone through were also very careful in keeping their working places in good condition, so that the men following them could not find any fault with their work pertaining to safety.

In the month of April, 1916, all of the surface plant was added to the Safety Department under the same inspector. This work began similar to the underground work by talking safety to the bosses and men to win their confidence and get them interested in the movement. Many improvements were made by placing guards around machinery, removing exposed set screws and keys, many new runways were installed for oiling purposes, old runways without hand rails had them put on, etc. Later, the foremen of the various departments decided to select one of their own men each month to make an inspection of their department, report the conditions to him and have a copy sent to the inspector, which was continued until the present system of committees was organized.

The present system was organized and the first meetings held in February, 1925. The organization was divided into two divisions, underground and surface, each division having a central committee and a workmen's committee. At a special meeting of all the superintendents and foremen the surface central committee was chosen, consisting of nine members, and the underground central committee, consisting of the superintendent and all the foremen. The surface workmen's committee consists of a representative from each department, and the underground committee a representative from each boss working 10 or more men. The workmen's committees were appointed by the safety inspector after a careful canvass of the employees as to whom they would prefer to represent them, with the understanding that all retiring committeemen, after serving a term of six months, will elect their own successors.

Meetings are held each month and the minutes of the workmen's committee read to the central committee at their regular meeting when the recommendations are taken up and acted upon. The minutes of the central committee are also read at the workmen's meetings so they will have an understanding of the actions taken on their recommendations.

Since this system was organized, a few changes have been made to stimulate a greater interest in the work. It is the duty of the underground workmen's com-

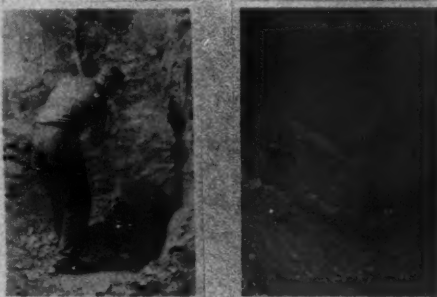
mittee to make a weekly inspection trip through their respective runs, notify their shift bosses of the conditions found and make a written report to the inspector. While making their inspection trips they found such a vast difference between the men who had served on the committee and those who had not, they deemed it advisable to reduce the length of the term to three months instead of serving six months, so as to get the men through quicker so they will all have an understanding of what the safety department is doing for them. This change has been made and is in effect at the present time.

To stimulate the interest among the foremen and bosses the surface central committee has included all superintendents and foremen as members, with an invitation to all shift bosses to attend all meetings when convenient, and the underground central committee has included all shift bosses as members. The safety department at the present time is represented by 78 members.

Accidents require a special study. A repetition of similar accidents indicates the underlying causes have not been studied thoroughly and followed up. It is the duty of the workmen's committee to investigate all time-lost accidents and report on the same. To assist them in making these reports and to encourage them to make a thorough inspection they are supplied with a special accident re-

PICKING INTO A MISSED HOLE

ONE of our employees was killed last year by picking into a missed hole. He had been warned of it by the other shift. The hole was a bottom plug hole and was covered by loose rock from the other blasts.



DON'T PICK AROUND MISSED HOLES.

If you must use a pick, "go easy" and use it to pry with or as a rake. Every muck pile is liable to contain loose powder.

WATCH FOR LOOSE POWDER.

Examine boulders before breaking them, as they may contain powder in a drill hole.

REMEMBER DANGER LURKS IN THE MUCK PILE.

PROTECT YOUR FEET

AVOID USING A LOOSE BLOCK UNDER STOPPING MACHINES.

IF YOU MUST USE A BLOCK, USE A LARGE ONE, AND LINE IT UP WITH



MACHINE, HOLDING IT IN PLACE WITH CLEATS. KEEP YOUR FEET AS FAR AWAY AS POSSIBLE.

SEVERAL OF OUR EMPLOYEES HAVE RECEIVED SERIOUS INJURIES IN THIS WAY WHICH COULD HAVE BEEN PREVENTED.

port blank, which is filled out by them and delivered to the safety inspector.

At the first meeting of each new committee, it is customary to have some of the officials present and express to them their feeling of gratitude for the support of the workmen toward this movement. This encourages them and makes them feel that they have the support of the management behind them, which seems to give them new life for the work they are entering. A chairman and a vice chairman is elected from the floor to serve throughout the term with the inspector acting as secretary.

At first the recommendations started to come in very rapidly and continued to do so for some time. A few meetings ago both the underground and surface committees were asked why there are so few recommendations coming in at present. Practically the same reply came from both parties saying—their boss won't give them any chance. As soon as the boss is told about anything, the work is done, and there is nothing to report. This was very gratifying to the safety department, and we hope that it will continue. It shows that the safety education is spreading and more interest is being taken toward this movement. In addition to the list of recommendations recorded, many suggestions have been made by the workmen's committees whereby special investigating committees have been appointed and the work done before the next meeting which never went before the central committees. Also the same results have taken place at the central committees meetings.

A number of the recommendations presented by the workmen's committees were considered too great an undertaking for the central committees and a special committee has been appointed to take the matter up with the general manager, which has been done, and the work completed. Also a number of recommendations have been mentioned to the bosses which they considered too great an undertaking, and advised the committeemen to bring it up at the safety committee meetings. We may get from this that some of the big jobs would probably not have been done until some one was injured if it were not for the cooperation displayed at these meetings. It is also very interesting to notice the value of these recommendations as shown by the fact that from February, 1917, to September, 1920, there were 288 recommendations presented by the workmen's committees, of which 284 have been adopted and completed. In addition to the safety value, it has also been proven to the central committees that many of these recommendations increased the operating efficiency.

Following is an outline of the present safety organization:



Old Dominion Mine and Mill, Globe, Ariz.

OLD DOMINION COMPANY SAFETY ORGANIZATION

March 14, 1925, to Present Date

COMPILED BY ALBERT TALLON, SAFETY INSPECTOR

1. General Safety Committee:

Chairman—W. G. McBride, general manager.

Secretary—A. Tallon, safety inspector.

Members—I. H. Barkdoll, Chas. Mendelsohn, D. L. Forrester, A. Caillaud, and R. W. Mayne.

2. Mine Safety Committee—East Side:

Chairman—R. W. Mayne, general foreman.

Secretary—A. Tallon, safety inspector.

Members—Foreman (permanent) and three workmen (three months).

3. Mine Safety Committee—West Side:

Chairman—R. W. Mayne (general foreman).

Secretary—A. Tallon, safety inspector.

Members—Foreman (permanent) and three workmen (three months).

4. Mine Surface Safety Committee:

Chairman—I. H. Barkdoll (mine superintendent).

Secretary—A. Tallon, safety inspector.

Members—Three workmen (three months).

5. Concentrator Safety Committee:

Chairman—D. L. Forrester, superintendent of reduction (permanent).

Secretary—A. Tallon, safety inspector.

Members—Three workmen (three months).

6. Miscellaneous Surface Safety Committee:

Chairman—C. Mendelsohn, mechanical superintendent (permanent).

Secretary—A. Tallon, safety inspector.

Members—Three workmen (three months).

7. Safety Inspector:

Albert Tallon.

8. Mine Bosses Conference:

Chairman—Dick Anglin (one year).

Secretary—A. Tallon, safety inspector.

Members—All foremen and shift bosses and others in positions of authority.

9. Surface Foremen's Conference:

Chairman—Wm. Fitzpatrick (one year).

Secretary—A. Tallon, safety inspector.

Members—Surface foremen.

The secretary of all committees shall be the safety inspector who shall serve permanently. Workmen members of committees shall be appointed by the chairman in consultation with the safety inspector and shall serve for a period of three months. All other members shall serve for one year or until their successors are appointed. All committees shall meet once a month and make a monthly inspection of the part of the plant they cover.

The department committees (2, 3, 4, 5 and 6) shall have authority to pass on all safety questions in their respective departments and shall proceed as soon as possible to carry out any safety provision. Delay is not only dangerous, but causes the men to lose interest. Workmen members should be consulted freely and urged to give their ideas and other workmen on the plant should be asked to call to the attention of the committee any dangerous condition. Questions which involve a heavy expenditure or affect general policy of the company should be referred at once to the general committee for prompt action. In case where the representatives of the management on the committees and the workmen can not agree on any specific question, it should be referred to the general committee for final decision.

Foremen and bosses should be given to understand that they are not relieved of responsibility for the safety of their men. The committees are intended to coordinate safety efforts, promote safety interest, and assist the bosses and foremen to make their working conditions safe, but the ultimate responsibility for accidents must rest with the boss. Bosses should be drawn into discussion of proposed changes to be made in the interest of safety.

When a committee has decided on a safety measure, it should be put through as quickly as possible and the order should not be changed nor canceled without first consulting the committee. Neither manager, superintendents nor anyone else (Continued on page 232)

DEVELOPING RESPONSIBILITY FOR ACCIDENT PREVENTION and MAINTAINING INTEREST in the CAMPAIGN

By C. L. HIGHTOWER*

First And Most Important Factor in Accident Prevention Work Is Support From Management—Full-Time Safety Man Recommended—Developing Individual Responsibility, And Dissemination Of Information Major Items In Any Successful Plan—A Description Of The Plan Inaugurated By This Company Which Is Proving Successful

A FEW years ago the average industrial executive entertained the erroneous belief that accidents were generally unavoidable and were either caused from inherent hazards of the business or were necessary to its development. Thanks to the efforts of the more progressive companies the successful executive in any business now concerns himself with the why, when, and how of accidents with a view to their prevention.

This change in attitude on the part of industry and the individual executive has resulted from two reasons, namely, humanitarian and economic. The relationship of employer and employee has undergone some radical changes in the past few years, and the old policy of one trying to obtain an advantage to the others loss has become obsolete. In its stead there has developed a recognition of the mutuality of interests. Both have realized that they can best serve their own interests by concerning themselves with the problem of the other. Industry has been brought to face the problem of the welfare of its employees, and has responded whole-heartedly in shouldering its responsibility.

The widespread publicity given the safety movement during recent years has developed in the public mind a higher regard for human life and has also been a factor in furthering the industrial safety movement, as the spirit has been carried into the mine, factory and plant, and has awakened in the industrial executive the interest to alleviate the suffering and waste that accompanies accidents, simply that he realizes in the work an opportunity for service to humanity.

That accident prevention is justified from an economic standpoint is unquestioned. The promulgation of workmen's compensation insurance premium rates on the basis of the experience of the individual company has, no doubt, prompted a great many companies to organize for accident prevention, as they could readily see an immediate and direct revenue from the money and effort expended. The lowering of accident frequency and severity means a lowering of insurance premium rates. However, as one eminent industrial executive has

said, "It does not matter what the motive is, it is sufficient that an organized effort in all industries is now being made to lessen accidents and prevent sorrow, suffering and waste."

The first and most important factor in organizing for accident prevention is support from the management. By support is meant an active interest and participation in the movement by the management. A passive interest is more harmful than beneficial and many companies fail in their safety work because of this lack of support. The reason is, of course, obvious. The same interest and regard for the movement as manifested by the executive will be reflected by the department head, superintendent, foreman, and so on down the line.

The second important factor is the assignment of the work to some one individual. The old adage: "Everybody's business is nobody's business" is particularly true when applied to safety work. By this it is not meant that the responsibility for accidents should be placed on any one individual, but that there must be some one individual made responsible for seeing that the safety program is carried out, to make comparison reports, and develop new plans for maintaining interest in the safety educational program. The companies having the greatest success in accident prevention have been those companies who have placed a safety director or manager directly in charge of the campaign.

The next step in organizing and conducting the campaign has to do with the methods employed in developing the individual responsibility for accidents and in the dissemination of information relative to remedial measures. When we realize that 85 percent of industrial accidents result from human failures, as distracted attention, forgetfulness, etc., we can readily see the importance of impressing the workman with his responsibility

in the accident prevention movement. He must also be educated as to the hazards of his work and must be trained to think safety as well as to form safe working habits.

There is, of course, a responsibility of management in the correction of physical hazards and provision of first-aid facilities, but the success of this phase of the safety campaign is dependent also on education and the subject will be treated in a later paragraph.

The most effective means of developing the individual responsibility for accidents comes through a placement of responsibility for accidents directly with the supervisory executives, by the management. When the department head or superintendent realizes that he is held accountable to the management for the accidents occurring in his department or plant he will in turn look to his divisional supervisors for managing their respective divisions with as few accidents as possible. The division supervisor will in the same way hold the foreman accountable to him and the foreman will place the responsibility of working safely directly up to the workmen, so, by starting with the management, a sense of responsibility for accidents permeates the entire organization down to the workman.

Many other advantages than the development of the individual responsibility come from this plan. In the first place it insures that closer supervision will be given to the selection and placement of men as well as to the physical condition of property and equipment. Knowing that he will be called to task for any accidents in his crew resulting from negligence or carelessness of workmen or from improperly maintained equipment the foreman will naturally give closer supervision to these items. He will be also more susceptible to the recommendations and suggestions from the safety department as he will realize from this source a service which will be of assistance to him in bettering the accident record of his crew for which record he will be either praised or reprimanded.

Next in importance to the placement of responsibility for accidents comes the educational activities. Because of the many phases of this activity they are

* Safety Director, Texas Pacific Coal and Oil Co., Thurber, Texas.



© Harold Gray

*"April — — —
Laugh thy golden laughter,
But, the moment after
Weep thy golden tears!"*



A group meeting in one of the field districts



The winning team in an Inter-company First Aid Contest

here discussed under the following headings: Group meetings, Hazard analysis and follow up, Investigation of accidents, Posters, Suggestion systems and First-aid training.

Group meetings are generally recognized as the most effective medium for reaching the workmen. Some companies follow the committee system of employee contact. This committee consists of from 3 to 12 men (depending on size of plant or district) whose duties are chiefly to make inspections of the properties and investigate accidents. In some instances the committee work is supplemented by semi-annual or annual meetings of all employees. Most often, however, the committee plan is relied on entirely for the employee contact, new members being appointed every 30 or 60 days, on the theory that eventually all employees of the plant or district will receive direct education through having served on the committee. It is evident that it would require some time to reach all employees through the above plan and that with a constantly changing personnel it would be almost impossible to have each workman serve on the committee.

In the belief that the best results in educational efforts comes through personal contact the Texas Pacific Coal & Oil Co. started the practice of holding monthly meetings of employees from the time of inception of the safety work which was July 1, 1926. A definite organization is maintained in each district or plant for carrying on the work. This organization consists of a chairman and secretary and an inspection and program committee. The plant or district superintendent is usually elected as chairman while the place of secretary and the membership of the committees are made up of men from the rank and file. The chairman and secretary are elected permanently while the personnel of the committees changes completely every three months, one new member being added at each meeting.

The chairman presides at the safety meetings and also acts in an advisory capacity with the committees. The secretary keeps the minutes of the meetings, follows up on suggestions, maintains the

first-aid room or kit and acts as instructor in first-aid work.

It is the responsibility of the inspection committee to go over the properties between meetings and report on conditions found. The effectiveness of the inspection committee's work depends largely on the individual members. If they are energetic and possess initiative, they will find something worth while to report on. Some of our most practical and helpful suggestions have come from these inspection committees.

It is the responsibility of the program committee to prepare or arrange for a talk, paper or subject for discussion at the meetings. It is felt that such a paper or talk is very valuable as they develop a great deal of real thought for safety in their preparation and are usually practical and presented in the language of the workmen. This plan could not be followed out very successfully, however, among foreign speaking workmen or those of very low intelligence.

It has been found necessary to supplement the work of the program committee to insure a complete and well balanced program. This is done by sending out with the schedule of meetings each month a suggested list of subjects. These subjects are prepared by the safety department and are made up after a study of the accidents occurring during the previous month. As an example if an accident occurs due to a workman not wearing goggles while doing chipping work, the suggested subject for the following month is "On what classes of work should goggles be worn?"

A representative of the safety department attends each meeting and discusses accidents occurring in other plants or districts, pointing out means of prevention. Arrangements are also made occasionally to show a safety film and periodic first-aid contests are also held. We have found it necessary to vary the programs in order to maintain the greatest interest. A great many of the meetings are held on company time. When meetings are held at night arrangements are usually made for refreshments or some special entertainment feature.

In addition to the results in accidents

prevention that come from group meetings of employees, we feel that it creates a better spirit of cooperation between individuals and departments and has a good effect generally on the morale of the organization.

We must know the dangers of the operations if we are to apply preventative measures. In the belief that employees could be of greater assistance in eliminating and avoiding accident causing conditions, if they knew more of the dangers attendant to their work, the general safety committee, which supervises our safety work, authorized the preparation and distribution of a hazard analysis pamphlet. The analysis was made up from a study of accident causes reported over a four-year period and from information obtained in interviewing workmen and superintendents as well as that brought out in discussions at safety meetings. The analysis was made up by occupations, the hazards of each job being included under the headings of laborer, machinist, etc. The occupations were then grouped according to departments and a pamphlet printed for each department. Information on the company's policies regarding safety and on first aid was also included in the pamphlet. The pamphlets were then distributed, each employee receiving one with definite instructions to carefully study it and to adhere to the suggestions given.

As a follow-up to insure that the pamphlets are being studied we question employees as to their knowledge of the hazards of their work at the monthly safety meetings. A more extensive means of follow-up is now under consideration. We are planning to make a series of pictures showing the safe and unsafe methods of performing the work on different jobs and will use these pictures as still picture projections, supplementing the pictures with lectures.

There has been severe criticism by safety men in some quarters of written propaganda in safety education; the criticism being based on the belief that employees will not read and study the literature. This is perhaps true if no follow-up is attempted, but the results from the distribution of the Hazard

Analysis Pamphlet, so far as we have been able to determine, have been gratifying and has prompted us to give further thought to a more systematic and extensive follow-up plan.

All accidents, regardless of their severity, are investigated by a representative of the safety department and a written report giving the results of the investigation with recommendations is made to the department head under whose supervision the injured man works. A copy of this report is also given the General Safety Committee. In this investigation the injured man, the foreman and the superintendent are interviewed in an effort to obtain all information relative to the accident. The investigation is made with the view of eliminating the condition and to avoid future accidents rather than to place the responsibility. The responsibility is determined, however, and recommendations as to disciplinary action is made where it is considered advisable.

The value of safety posters is almost entirely dependent on the neatness with which the boards are maintained and the schedule of posting. If bulletins are displayed for a considerable length of time or the board itself is poorly lighted and unkept, interest in the posters will not continue. Each of our plants and district field camps are furnished with a display board and are located in a well lighted and convenient place. The posters are changed each week, new posters being mailed out from the safety office.

In the seven months that our suggestion system has been in effect we have received some 60 suggestions over 50 percent of which have been accepted. Suggestion boxes are located conveniently over the properties and the suggestions are collected once each month. The General Safety Committee passes on all suggestions and awards a cash prize for all accepted. We feel that our suggestion plan has been effective in enlisting the interest and thought of employees on accident prevention and has been well worth the effort and expense from this standpoint alone. However, many suggestions have been received which effected a substantial saving in operations.

The mining and petroleum industries are indeed fortunate in having available the services of the Bureau of Mines first-aid training staff, and it is very gratifying to note the many companies which have availed themselves of this service during the past few years.

Arrangements were made by the Texas Pacific Coal & Oil Co. for a first-aid instruction unit to visit its several oil development and refining districts and also its coal mines, at Thurber, Tex., during the early part of last year. Under the direction of the bureau approximately 80 percent of the company's field

HOURS OF EXPOSURE AND ACCIDENTS RATES				
Period	Total Number Accidents	Lost Time Accidents	Severity Rate	Frequency Rate
July 1, 1925, to June 30, 1926.....	637	214	2.629	78.9
July 1, 1926, to June 30, 1927.....	429	222	1.618	78.7
Claim costs per employee—1925-26—\$21.57	Claim costs per employee—1926-27—\$17.06			

force were trained in first-aid methods. A mine rescue crew was also trained at Thurber. We feel that this first-aid training has been, perhaps, the most effective phase of our safety campaign. It is undoubtedly true that the workmen have a greater appreciation for accident prevention work after completing a first-aid course. A knowledge of first-aid measures is also often responsible for saving a life and lessens the disability of many severe injuries through proper handling.

Only a short time ago an employee in one of our Oklahoma districts was resuscitated by a fellow workman after having been overcome by an electric shock sustained while in the act of charging the battery of a car with the use of a 110 volt battery charging set. We feel that the saving of a life in this instance repays us many times for our efforts and expense in safety work.

In order to maintain interest in first-aid work contests between teams of different plants or districts are frequently held.

The first-aid room and the first-aid kit are necessary to the success of any safety campaign. At concentrated points, where as many as a hundred men are employed, we maintain an emergency hospital room. These emergency hospitals are equipped with regulation hospital beds, stretchers, H. H. inhalators, complete supply of first-aid medicines and hot and cold running water. A competent first-aid man is available to each emergency hospital. These emergency hospital units are also maintained at isolated districts which are far removed from a physician.

At the plants and field districts which are readily available to a doctor only the stationary kit is maintained. Small size automobile or travel kits are furnished transit crews in the field whose work carries them away from field headquarters. The smaller kits are furnished with aromatic spirits of ammonia, burn dressing, sterile dressings and an antiseptic.



A room in the emergency hospital

The provision of guards is very important and is a responsibility that should be readily accepted by the management and taken care of at the earliest possible date. This is advisable for several reasons, first, accidents resulting from unguarded machinery usually result in the most serious and costly cases. Second, to work around machinery that is properly guarded and affords ample protection, gives the workmen a sense of security which enables greater efficiency in the work. Third, a removal of physical hazards by guarding evidences to the workman a sincerity of purpose on the part of management in the safety campaign and enlists greater support from him for the movement.

Some times educational effort is necessary before the guarding program is undertaken. Unless a worker is impressed with the need of the guard he is likely to remove it and use the machine minus the guard. It is also true that the superintendent of a plant or district is most often relied on to install the necessary guards. Although this is usually done according to specifications furnished by the safety department, the superintendent is likely to go to unnecessary expense or delay the work unless he fully appreciates the necessity of such guards and, for this reason, it is some times advisable to precede the guarding of machinery with an educational program.

A review of the results of our accident prevention campaign at the end of the first 12-month period revealed that we had made a reduction of 208 in the number of accidents as compared to the previous 12-month period and that there was also 2,563 days less loss time during that year than the previous year.

The above table is a comparison of frequency and severity rates for the periods mentioned and also a statement of claim costs per employee for the two years.

For the three-month period ending September 30, 1927, our severity rate was .624 and our frequency rate 58.2, and we hope to be able to show a more favorable reduction during the present year than was made the first 12 months.

We feel that the solution of the problem depends on the development of individual responsibility for accidents by every member of the organization and the dissemination of information regarding accident causes and means of their prevention through an intensive educational campaign.

The EXPLOSIVES DIVISION U. S. BUREAU of MINES

By CHARLES E. MUNROE*

Most Important Duty Of This Division Is The Testing Of Explosives Submitted For "Permissibility" And The Supervising Of Permissible Explosives For Use In The Mining Industry.

EXplosives are the prime essential to mining on its present-day scale. Hence a division of explosives is an essential factor in a Bureau of Mines organization. As a fact, in the building up of the U. S. Bureau of Mines by the step-by-step process the investigation of explosions and explosives was one of the first duties assigned it by the Congress.

Explosives are the products of chemistry, and like all products of this science, or the industry built upon it, they are in a continued state of development, for new primary compounds are being discovered, or new and peculiar compositions devised, with great frequency. Since at any time these new explosives may be offered for use in mining, it is a duty of the Explosives Division, by constant review of the chemical and other technical literature, to keep informed of this progress and, in the most significant cases, to become early acquainted with the characteristic properties of these new substances by actual investi-

on in both the chemical and physical sections since the foundation of the bureau, and is considered



Ballistic pendulum for determining the unit deflective charge of an explosive—a measure of the "coal getting" strength of an explosive. Above—Blasting for construction of the Panama Canal. The Bureau at this time investigated the means for waterproofing detonators



Bomb-proof used in the testing of explosives during the war. At this time this Bureau served practically as a research division of the Army and Navy



gations in the laboratory and the physical testing plant, and many articles resulting from these investigations have been published by members of its staff.

Such research work has been carried

one of its most important duties. As a fact, during the first six months of the existence of this undertaking, and prior to securing the use of the Arsenal grounds in Pittsburgh, the small staff then assembled was engaged in the laboratories of the George Washington

University, partly in compiling statistics of mine explosions, and partly in the investigation of means for waterproofing of electric detonators and methods of testing their water-resistant capacities; a subject to which little attention was then paid commercially, but one which had assumed great importance in the Government's large blasting operations then going on in the Canal Zone. And ever since there have been several investigations going on at all times, which have thus far resulted in the publication of upward of 200 books, journal articles and papers. Many of these have dealt with fundamental constants or the study of explosive phenomena, a precise knowledge of which is essential to the better comprehension and solution of the practical problems presented for consideration. Two such investigations now in hand are the precise determination of flame temperatures, and the photographic

* Chief Explosives Chemist.

study of the phenomena of detonation and of shock waves. Among practical problems to which valuable contributions have been made are the "Effect of stemming on the efficiency of explosives" and the "Effect of cartridge diameter on the strength and sensitiveness of certain high explosives."

As the work has developed, the need of better methods and devices has been felt. The chemical staff is continually engaged in developing new methods of analysis through which to analyze the new substances or combinations presented for tests, and a quite considerable number of publications have resulted therefrom. On the physical side may be mentioned the "pendulum friction machine," "the sand test bomb," and "the dumb-bell" among the several forms of apparatus devised at the bureau which have met with acceptance. The pendulum friction machine was the first mechanical device invented with which to ascertain the relative sensitiveness of explosives to explosion from a glancing blow.

The Explosives Division of the Bureau of Mines is, naturally, expected to be the repository of all knowledge concerning explosives and explosions, except military explosives, which are under the jurisdiction of the ordnance divisions of the War and Navy Departments, and consequently it is continually being called on for information, advice, and sometimes assistance, by many different divisions of the Federal Government, officials of states and municipalities and many private individuals, and these calls are not infrequent. During the war it served practically as a research division of the Army and Navy.

Because that "when this country is in a state of war" the enforcement of explosives regulations throughout the United States devolves upon the Director of the Bureau of Mines, it is evident the division should keep informed on accidents from and outrages committed with explosives that it may be prepared to intelligently deal with these matters when the emergency arises. Hence, so far as other duties permit, these events of the day are examined into, and it not infrequently happens that information of value in the performance of its more regular duties results.

Obviously, the most important duty of this division, which evolved as an immediate consequence of its first assignment by legislation, is the testing of explosives submitted to it for "permissibility" and the supervising of permissible explosives appearing in the coal-mining industry through the testing of field samples of them.

This is a never-ending undertaking because, as pointed out above, "new" explosives, possessing what is believed to

be desirable characteristics, are frequently being brought forward as aspirants to the permissible list.

Explosives for use in metal mining, quarrying and engineering operations are not neglected, and suitability tests of them are made as called for, but as there appears no demand for the standardization of such explosives as these, they have been given less consideration than permissibles.

THE WORK OF THE NATIONAL SAFETY COUNCIL

(Continued from page 224)

highways, in other public places, at home, on the sea, in the air, and throughout industry. Its press service is used by thousands of daily newspapers, trade, technical, and class periodicals. More than 225 daily papers publish timely safety illustrations supplied by the council. Daily radiograms are sent to 80 broadcasting stations.

Officers of the Mining Section of the council for 1928 are:

Chairman, C. A. McDowell, Pittsburgh Coal Company, Pittsburgh, Pa.

Vice Chairman, George Martinson, Pickands, Mather and Company, Hibbing, Minn.

Vice Chairman, A. W. Dickinson, The Union Pacific Coal Company, Rock Springs, Wyo.

Vice Chairman, J. P. Hodgson, Phelps Dodge Corporation, Bisbee, Ariz.

Vice Chairman, F. C. Miller, The Colorado Fuel and Iron Company, Trinidad, Colo.

Secretary, Daniel Harrington, United States Bureau of Mines, Washington, D. C.

Poster Committee Chairman, H. C. Henrie, Phelps Dodge Corporation, Bisbee, Ariz.

Membership Committee Chairman, H. I. Young, American Zinc, Lead and Smelting Company, Mascot, Tenn.

Publicity Committee Chairman, Theodore Marvin, *The Explosives Engineer*, Wilmington, Del.

Slide Committee Chairman, H. G. Hensel, The Youngstown Sheet and Tube Company, Chicago, Ill.

Program Committee Chairman, R. V. Ageon, Tri-State Zinc and Lead Ore Producers' Assn., Miami, Okla.

Engineering Representative, J. M. Carmody, *Coal Age*, New York, N. Y.

Statistics Committee Chairman, Rush N. Hosler, Pennsylvania Compensation Rating and Inspection Bureau, Harrisburg, Pa.

News-Letter Editor, Daniel Harrington, United States Bureau of Mines, Washington, D. C.

Executive Committee, the officers and B. C. Yates, Homestake Mining Company, Lead, S. Dak.; B. F. Tillson, The New Jersey Zinc Company, Franklin, N. J.

SAFETY PROGRAM OF THE OLD DOMINION COMPANY

(Continued from page 227)

should change a ruling of departmental committee without the approval of the general safety committee or the departmental safety committee concerned. Rules should be enforced or repealed. Committees should see that after safety appliances are provided, the foreman insists on their use.

In addition to the above, the Phelps Dodge Corporation Safety Committee was organized at the same time, consisting of P. G. Beckett, as chairman (general manager Phelps Dodge branches and Old Dominion Company), and Gerald Sherman (consulting engineer), as secretary. Members—Chairman of the general safety committees of the different branches. This committee rotates and meets at the location of one of the branches every three months.

Each of the underground safety committees takes two days for the inspection with a meeting on the second afternoon, after the inspection, when the records of the previous month of both committees, the accidents for the current month, and the comparison of accidents for the year to date are all read and discussed; after which the meeting is thrown open for the discussion of any new safety suggestions or recommendations that may be brought before the meeting.

While making the inspection, each place is graded and marked in some conspicuous place with chalk as to the conditions found and decided upon by the committee. The following letters are used for the grading of the working places: "E" for places that are in excellent safety condition, and no suggestions are made; "G" for places considered good, but one or more minor safety suggestions are made; "M" for medium; and "P" for poor. This is continued with a follow-up letter to each of the shift bosses commending them for the excellent and good safety conditions found on their runs, and calling their attention to the unsatisfactory conditions.

The surface inspections are usually made and completed in a half a day.

The following figures may be of interest. During the year 1926 our time-lost accidents were reduced 56 percent over the year 1925, and a 50 percent reduction for the eight months of 1927, in comparison with the first eight months of 1926.

Commerce Reports for March 26, published by the Department of Commerce, contains an article entitled "Developments in the German Aluminum Industry," by Consul H. C. Claiborne, Frankfurt-on-Main.

HISTORY of the HEALTH AND SAFETY BRANCH of the BUREAU of MINES

By R. R. SAYERS *

THE work of the Bureau of Mines, now carried out by the Health and Safety Branch, was first organized as the Mine-Accidents Division of the Technologic Branch of the United States Geological Survey on May 22, 1908. This division had for its purpose "the protection of the lives of miners in the territories and in the District of Alaska and the conducting of investigations as to the cause of mine explosions with a view to increasing safety in mining."

In 1909 there were 19 employed on full time duty and 3 consulting engineers on part time. At this time the safety work consisted in giving public demonstrations one day each week at the Pittsburgh station in the use of rescue apparatus and miners were sent in for training from the different mining regions.

Increase in disasters in coal mines and a growing realization of the waste of both life and resources in the varied mining and metallurgical industries of this country led to the establishment by act of Congress, approved May 16, 1910, and effective July 1, 1910, of the Bureau of Mines in the Department of the Interior. The general aim and purpose of the inquiries and investigations made by the bureau under the terms of the organic act are to increase health, safety, economy, and efficiency in the mining, quarrying, metallurgical and miscellaneous mineral industries of the country.

On July 1, 1910, the new Bureau of Mines had a force of 124. The work was organized, under the terms of the organic act, into three separate groups: mine-accidents investigations, fuel investigations, and other technologic investigations. For convenience of administration, all the work relating to mine accidents, health, and mining technology was organized as the Mine-Accidents Division of the bureau. There were in operation at the end of the fiscal year 1910-1911 six mine-rescue stations and six mine-safety cars, and the personnel of the bureau numbered 298; the personnel of the mine-safety cars and stations numbered 31. The first-aid training work was not added to the other training already adopted by the bureau's mine-safety stations and mine-safety cars until about October, 1910.

Within a few months the popularity of the instruction in first-aid work and in the use of breathing apparatus was such that the holding of contests was given early consideration by mine officials and workers in various coal fields outside of the anthracite region in which such instruction was then being introduced for the first time.

On October 30, 1911, a national first-aid meet was held in Pittsburgh, Pa. This was an exhibition of skill in first-aid work rather than a contest for prizes, as well as a general demonstration of various means of procuring safety in mining, including in particular a demonstration of rescue methods with breathing apparatus and of the relative merits of permissible and nonpermissible explo-

A Review Of The Purposes And The Results Obtained By The Health And Safety Branches Of The Bureau Of Mines As Presented To The 30th Annual Convention Of The American Mining Congress In The "Bureau of Mines Hour"

sives, the explosibility of coal dust was also shown in a large gallery. Nearly 2,000 people witnessed the demonstrations and exhibits. The spectators were all mine operators, miners, or persons interested in mining, and represented operations in all parts of the United States. At the public demonstration in Forbes Field, which was witnessed by President Taft, from 12,000 to 15,000 persons were present and attested their interest and enthusiasm in the mine-safety exhibits by remaining throughout the proceedings, regardless of the rain that fell all the morning.

The first meet for contesting events in mines rescue and first aid was held in 1914 at Terre Haute, Ind., followed by a second meet in 1915 at San Francisco, Calif. These events were not then known as annual events. During the year 1919 one was held at Forbes Field, Pittsburgh, Pa. In 1920, in order that the metalliferous mining interests might more easily participate, the meet was held in Denver, Colo. Since that one has been held in St. Louis, Mo.; Salt Lake City, Utah; Springfield, Ill.; San Francisco, Calif. and in 1927 in Pittsburgh, Pa. These meets are open to all miners, quarrymen, and workers in metallurgical plants and in the petroleum and natural gas industries, and are held under the auspices of the Bureau of Mines with the cooperation of the American Red Cross, the National Safety Council, and various mine operators' associations and miners' organizations. Contests for international championships in first-aid and mine-rescue methods are conducted, and various cups, medals, and prizes are awarded to the winners.

During the first fiscal year, 1910-1911, 7,183 miners were given partial training in rescue work, 6,783 in first aid, and 509 certificates were issued for completion of training. During the fiscal year 1926-1927, 25,151 miners received initial training in mine rescue and first aid. Since the beginning of this work the bureau has instructed about 210,000 miners and has also given instruction to others connected with the allied industries.

In 1912 the Bureau of Mines had an administrative division in Washington and a mining, a mechanical, and a chemical division, each in charge of a division chief, with headquarters at Pittsburgh. The safety work, including safety investigations, was administered chiefly through the Mining Division.

Very soon after the bureau was organized investigations were begun of mine accidents with a view to determining their cause and the best methods for their prevention. Among these were investigations of gas explosions, coal dust



Dr. R. R. Sayers

explosion accidents from the improper handling or use of explosives, accidents from electricity, and accidents from miners' lamps; testing of breathing apparatus for safety, investigation of mine disasters and mine fires, and, a little later, studies as to the use of rock dust for the prevention of coal-dust explosions. The findings of these investigations have been published in the form of bulletins, technical papers, and press notices. The information thus obtained has also been used in developing another course of instruction which is given to mine officials, state inspectors, and those having responsibility for the safety of the mines. This advanced training gives instruction in the handling of mine fires and explosions. The information also has been adapted to a course on accident prevention. Accident prevention is a part of the instruction now given with the first-aid, mine-rescue, and advanced training in mine rescue and recovery operations.

Almost immediately after the establishment of the Bureau of Mines in 1910, an arrangement was made with the Public Health Service by which one or more surgeons connected with that service could cooperate with engineers of the Bureau of Mines on investigations looking to the improvement of mine conditions affecting health. Other physicians, who had no particular relationship to the Public Health Service, were also secured by the bureau through the Civil Service. It was found difficult, however, to obtain suitable surgeons for this work and a definite arrangement was entered into in 1914 with the Public Health Service whereby that service would be responsible for the selecting and detailing of all medical personnel to the Bureau of Mines.

At first the work consisted principally of a general survey of conditions, but in 1914 studies on definite problems, as investigation of siliceous dust and its effect on the health of miners in the Joplin, Mo., and Butte, Mont., districts, were undertaken.

The cooperative work with the Public Health Service gradually expanded, more surgeons were detailed to the work, and in February, 1920, the office of chief surgeon was created. The activities of this division included experimental studies on carbon monoxide and other poisonous gases encountered in the min-

*Chief Surgeon and Chief, Health & Safety Branch, U. S. Bureau of Mines.

ing and allied industries, lead poisoning, physiological effects of atmospheric conditions, physical examination of miners, causes of death among miners, stream pollution from mine wastes, medical organization and industrial hygiene, sanitary surveys of mining camps, dust and ventilation in mines, etc.

In the early part of the fiscal year 1920, the bureau was reorganized with two main branches, the investigations branch and the operations branch. The safety work was separated from the Mining Division, with the designation of mine-rescue cars and stations, and placed in the operations branch. At this time the mining regions of the country were grouped within nine districts, planned with especial reference to convenience and efficiency. These districts were near the rescue stations and the headquarters of the rescue cars and did not coincide with the districts of the mining experiment stations of the bureau. Each district was in charge of a district engineer. There were 10 mine-rescue cars and 8 mine-safety stations.

In the reorganization of the bureau, effective June 1, 1924, the Division of Mine-Rescue Cars and Stations became the Safety Service Division in charge of a safety service director.

On July 15, 1926, a new branch, the Health and Safety Branch, was created to include the Health Division (formerly the chief surgeon's office) and the Safety Division (formerly the Safety Service Division). The Safety Division is in charge of a chief engineer and the Health Division is in charge of the chief surgeon, the latter also serving as the chief of the branch. There are 25 employees in the Health Division and the appropriation for the present fiscal year is \$64,680. There are 83 employees in the Safety Division and the appropriation is \$343,210. There are a total of 108 employees in the branch and the total appropriation is \$417,890.

In carrying out its work, the Health Division is subdivided into a field section and a laboratory section, which work in close cooperation and share a mutual interest in many of the problems undertaken. Whenever it is deemed advisable laboratory personnel are detailed to the field or field personnel are brought into the laboratory and in this manner problems and needs of the industry are dealt with by each section contributing the effort and information it is best fitted to give.

The work of the field section is carried on in cooperation with the United States Public Health Service (most of the personnel being detailed to the Bureau of Mines by that service) and in certain cases with mining organizations and other agencies interested in industrial hygiene.

From time to time the general information gained by these studies is incorporated in publications. Through the medium of these publications the causes of undesirable conditions as well as the methods which have been found most satisfactory in combating them are disseminated to the mining industry. At the time of making these investigations observations are made of the medical organizations and industrial hygiene. Reports dealing with these phases are also prepared and recommendations made for the improvement of existing conditions, or for the installation of efficient medical organizations and methods of hygiene where they are lacking.

In addition to general sanitary survey

work the field section conducts investigations relative to the effects of gases and dusts on the health of the workman. During the present year an agreement was entered into by the Bureau of Mines, the Metropolitan Life Insurance Co., and the Tri-State Zinc Ore Producers Association (composed of mine operators of the three States of Kansas, Oklahoma and Missouri), for the purpose of expanding the clinic already in operation by the Bureau of Mines at Picher, Okla., to afford facilities for examining each workman in the district at least once a year to determine the effects, if any, of the conditions under which they work on the health of the miners. A building adequate for the work has been constructed and equipped and is now in use. During the year 5,695 examinations of men and 260 of women and children were made; this, with 496 reexaminations of men, made a total of 6,451 examinations. A large amount of similar data have been secured previously from the coal and iron mines of Alabama, the lead-zinc mines of Oklahoma, and the gold mines of Nevada and California.

The causes of death among miners in the principal mining districts of the United States are being studied for the purpose of ascertaining the diseases and types of accidents most prevalent among miners with the object of instituting preventive measures. So far, data have been collected from the records of the States of Nevada, California, Arizona, Colorado and Wyoming. The study is partially completed in Alabama and Utah and will be continued until data have been obtained from all the principal mining districts of the country.

The laboratory section of the Health division conducts research work pertinent to the toxic limits and physiological effects of gases, as carbon monoxide, hydrogen sulphide, sulphur dioxide, etc., as well as devises apparatus and methods for their detection. Some of the laboratory and field studies which have been recently completed are the physiological effects of long exposures to low concentrations of carbon monoxide such as would be encountered in mines where the air would be slightly contaminated with mine fire gases, "after damp" from explosions, inadequate ventilation after blasting, or in automobile garages, vehicular tunnels, around blast furnaces, and many other places in the industries. This work supplements previous work done in connection with the ventilation of the Liberty vehicular tunnels, Pittsburgh, Pa., which are now in use, and the Holland tunnels, New York City, which were opened early in November, 1927.

Other major work conducted by the laboratory section has dealt with the health hazards in the use of ethyl gasoline, the toxic gases given off in the handling and refining of high sulphur crude oil; hydrogen sulphite poisoning in oil fields, in tunnels, and in caisson work; and the use of helium oxygen mixtures instead of air for deep diving and work under high pressure; also extensive investigations have been carried out on the physiological effects of abnormal temperatures and humidities.

The laboratory section is subdivided into laboratory units, each dealing with a more or less special phase of health research, as gas analysis laboratory, gas masks and respirators laboratory, pathological and physiological laboratory, and stream pollution laboratory.

The gas laboratory is a specialized

central laboratory for the purpose of analyzing and examining gas samples collected in mines throughout the country by the Bureau of Mines field engineers and frequently by state mine departments and works operators in connection with health and safety studies. These samples comprise atmospheres taken during: (1) Studies relative to improvement of ventilation in mines; (2) from sealed mine fire areas to determine the progress of the fire, as the composition of the gas gives an indication when the fire is out and the area is safe to enter and recover; (3) samples taken in connection with rescue and recovery work after explosions in order to safeguard the health and safety of the rescue workers; and (4) the development, testing and approval of mine equipment when gas-air mediums are required to ascertain the safety of their use in potentially gassy atmospheres. Approximately 2,000 samples were analyzed during the year 1926, many of which involved the determination of six gas constituents in each sample and most of which were analyzed in duplicate. In many cases the scene of this work is transferred from the laboratory to the places of actual occurrence of trouble in the industry. In cases of emergency, as mine explosions and mine fires where life and property are endangered, personnel are detailed from the laboratory to give assistance in their particular field of work. This service is also extended in many cases to state mine departments and to mine operators.

The gas masks and respirators laboratory investigates the use and suitability of industrial masks and respirators for encountering atmospheres containing toxic and deleterious industrial gases and dusts such as occur in mines and metallurgical plants, leaks from refrigerating machines, during fire fighting by municipal fire departments or in mines, railroad tunnels, etc.

One of the principal duties is to make rigorous tests of commercial masks submitted for the purpose by the manufacturer. If the appliance equals or exceeds certain test requirements, the manufacturer is granted an approval plate which he is permitted to display on his product, thereby giving the consumer a certification of its quality. If the device fails to meet the requirements the manufacturer is advised and given recommendations for improvement.

A recent development of this laboratory is an apparatus that will continuously record the amount of carbon monoxide in the air of mines, tunnels, commercial garages, etc. A number of these are being installed in the Holland tunnels, New York City, for the purpose of safeguarding the health and safety of the public and also as a control for the ventilation system. This device has other uses, as in the testing of household gas appliances and investigative work dealing with carbon monoxide poisoning.

Another accomplishment of importance to industrial hygiene has been the development of a readily portable and efficient apparatus for the collecting of atmospheric dust samples which serve as a basis for evaluating health hazards as well as testing the efficiency of devices and procedures for allaying or preventing the formation of dusty atmospheres. This latter is of outstanding importance in metal mines and stone quarries as a mitigation against silicosis and in coal mines as a pre- (Continued on page 236)

WORK of the CONSERVATION BRANCH of the GEOLOGICAL SURVEY

By HERMAN STABLER *

Activities Of This Branch Of Survey's Work Center Around Development And Use Of Mineral Resources On Public Domain

THE activities of the Conservation branch of the U. S. Geological Survey, as the name implies, are directed toward the wise development and use of the vast but still imperfectly known mineral resources of the public domain. The first step toward appropriate use of these resources is that of determining what and where they are and in what condition of recoverability. In addition to the more general work normally done by the Geologic Branch of the Survey, it is necessary for the Conservation Branch itself to plan, finance, and perhaps perform with its own personnel, the detail surveys needed in the leasing and development of the national mineral reserves. The Congress, in its wisdom, by means of limited appropriations, has decreed that this work shall proceed very, very slowly and that it shall be many years before knowledge of the mineral fuels and other deposits subject to lease is adequate for reasonably intelligent supervision. Nevertheless, a few thousands of dollars are spent annually in supplementing and perfecting available information. Such activities are of direct benefit to the mineral industry, particularly to the Government's permittees and lessees, in directing efforts toward maximum results with a minimum expenditure of money.

The second phase of the work of the Conservation Branch has to do with the disposal of mineral deposits and supervision of their development by private parties under the terms of the mineral leasing laws. This is typically the work of a landlord. The leasing laws contain no provision whereby selection of tenants can be made. First come first

served, regardless of qualifications, is the rule. As a result, most of the business of issuing permits and leases is done not with real adherents of the mining industry but with sooners, speculators, parasites, who without the money or experience to undertake development operations themselves, acquire rights from the Government that they hope to sell at good round profit to bona fide operators. Naturally enough 15 permits are issued, carried on the books, transferred, extended, and finally canceled without the doing of any actual work on the ground for 1 that becomes the scene of prospecting or development operations. I can not regard this as an aid to the mining industry or to the public. The terms of the Federal mineral leasing laws were in large part dictated by the mining industry. If the industry wishes a selective system of granting permits and leases that will eliminate the speculator and limit the number and extent of development operations to the reasonable needs of any given region, I have no doubt it could obtain amendments to the laws that would effect these very beneficial results.

Under present conditions aid to the industry begins with the initiation of bona fide development operations. Operations under the mineral leasing acts are being carried on as far east as Alabama and as far north and west as Alaska, and production has been reported from all States west of Missouri River except Kansas and Nebraska. Not only is all information regarding a leasehold placed at the disposal of a lessee

but a somewhat thinly spread force of engineers and other technical men is maintained in

the field of operations to advise and cooperate with lessees on the details of prospecting and development operations with a view to having them most wisely directed toward obtaining a maximum ultimate recovery with due regard for safety and economics. A good landlord has the interests of his tenant at heart. The supervision of mineral leases by the Conservation Branch is therefore undertaken in a true spirit of cooperation and helpfulness. Lessor and lessee alike are interested in maximum ultimate recovery, safety, and economy in operations. Diversity in point of view but not real diversity of interests sometimes occurs when a lessee proposes to waste essential values or take undue chances with life and limb in order to make large, quick profits. Naturally enough, the lessee is inclined to take a more short-sighted view of the situation than is the lessor, and there is abundant opportunity for compromise and determination of what is the reasonable thing to be done under any given set of circumstances—a compromise that may sacrifice something of ultimate recovery to the necessities of practicability.

The supervisory work is directly beneficial to the mining industry as a whole, and so far as possible is made to yield a direct profit to the lessee. A few examples typical of many are here cited.

In an oil field where the gas-oil ratio was excessive, production under back pressure was instituted with a daily saving on existing wells of over a hundred million cubic feet of gas previously being wasted. This gas will be available for

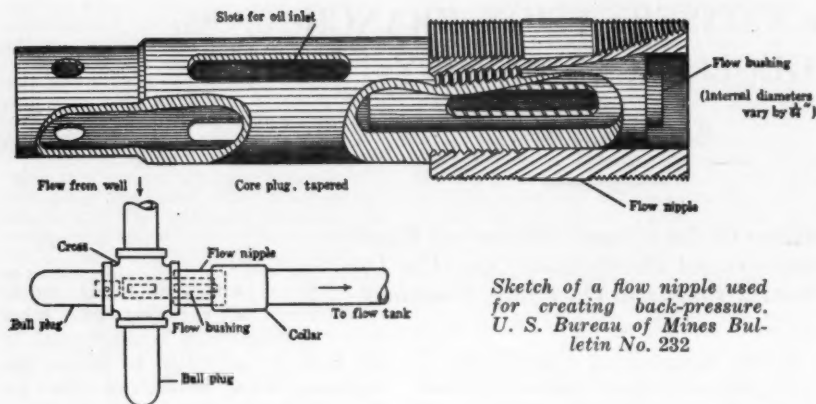


A "hay-wire" outfit is a menace to life and probable source of damage to oil-bearing formations



A battery of gas-light tanks avoids the evaporation losses of earlier days

* Chief, Conservation Branch, U. S. Geological Survey.



Sketch of a flow nipple used for creating back-pressure.
U. S. Bureau of Mines Bulletin No. 232

drilling, maintenance of production, ultimate oil recovery, and for sale. As a direct result of the conservation effort toward lengthened gas life of the field, a gas company has proposed to build a pipe line to the field and has offered to purchase all available gas. The gas saved has a present value under this offer of \$3,000 per day and will be worth several times that amount under the conservation program adopted.

In an oil field of small holdings of Government land by numerous independent operators unable to employ a petroleum engineer, the Government engineer acts as technical advisor to the operators and through an enlightened program of drilling, deepening, plugging back and operating wells, production has been increased in value to the amount of \$4,000 a day, most of which is believed to represent an increase in ultimate recovery, and a cleaner oil is being produced.

In another area of small oil and gas operations an engineer is giving much time to corrosion and well repair problems and guiding the operators in attempts to apply modern engineering methods to maintain or increase production. Such work is experimental and not always successful. Its value to the industry is indicated by the statement of an operator at the completion of an unsuccessful attempt to repair a well that he considered the time and money well spent.

An expert driller of the Government saved a 300-barrel oil well from water encroachment that had gotten beyond the powers of the operator to combat. Another operator personally thanked a supervisor for having required him to adopt a casing program at considerable expense and much against his will a few months before.

Many favorable comments have been received on the value to lessees of reports on inspection of coal mines, and requests for such inspection are not infrequently made. A coal operator even eventually expressed his satisfaction at having been required to close down a

mine. In one case it seemed necessary to cancel a lease when the lessee persistently neglected to take reasonable measures toward safe development, but the lessee has finally acknowledged the desirability and fairness of the measures recommended, has removed officials alleged to be responsible for unsafe conditions, and is taking steps to conform to Federal requirements.

In a case of a serious mine disaster a supervisor stepped to the fore and directed the work of rescue and rehabilitation until absent mine officials could arrive at the scene of action.

HEALTH AND SAFETY BRANCH, BUREAU OF MINES

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ventive measure against disastrous coal dust explosives.

The pathological and physiological laboratory usually works in conjunction with the other laboratories and with the field section in conducting studies and researches dealing with the physiological effects and pathological changes attending exposure to air containing various gases and dusts of known or unknown toxic action and effect on health. In addition to this, specific studies are undertaken on the pathology of carbon monoxide poisoning, pathological changes attending exposure to various gases, vapors, and dusts found in the industries, an important one of which is a study of the action of mineral dusts with special reference to the occurrence of silicosis. This has a practical application in the testing of inert rock dusts with which the workings of many mines are now periodically coated to render the coal dust non-explosive lest in the zeal of preventing coal-dust explosions another health hazard will be incurred.

The stream pollution laboratory is primarily engaged in studying the factors underlying the formation of acid mine drainage, its amount and possible means of disposal. To this end surveys are made of the character and amount

of acid water given off by mines in certain districts and its influence on the local streams. In these, the examination starts at the source of formation in different parts of the mine and is then followed out until it issues as a stream or is pumped from the mine. Particular attention is given to the potential acid-forming constituents throughout the course of the water and after the drainage enters fresh water streams its dissipation is observed.

In connection with these surveys particular attention has been given to drainage from abandoned or "worked out" mines. As these are no longer a source of revenue, little attention is paid to them though they usually continue to give off acid drainage for many years. It appears, however, that natural caving, which apparently shuts off the air and consequently the oxygen required to form acid mine water, gradually lessens the acidity of the water. In view of this a study is in progress relative to hastening the improved quality of the water by sealing these mines immediately after they are worked out or abandoned as well as applying the same method to the many mines of this class that now exist.

The information obtained by the Health Division as a whole is disseminated to the industry and the public through the medium of Government publications, the technical press, and in a large measure by correspondence and personal contact.



Russell, Ky., Yards of the C. & O. R. R., where all coal coming out of the Huntington field is mobilized

*"—both (operator and manufacturer) are working
to the same purpose—to get the coal out"*

ADVANTAGES of COOPERATION BETWEEN the MANUFACTURER and the MINE OPERATOR

By E. R. PHILLIPS*

THE present steady trend toward the complete mechanization of mining operations has raised new questions on the matter of relations between the mine operator and the manufacturer of equipment. The fact that mutual dependence has made cooperation between them absolutely necessary is too obvious for further comment.

The question does remain, however, as to just what the advantages of such cooperation are, and who will derive the most benefit from them. The idea that both benefit equally may come as a shock, without altering its basic truth. But, both are working to the same purpose—to get the coal out—and therefore both profit to the same degree by any improvements in machine design or operation.

This may seem a rather sweeping statement, but the fact that it works out in actual practice can easily be shown by a consideration of a few specific examples. Take standardization of equipment, for example. This is one advantage that depends directly on cooperation between the user and the maker of the machine in question. It would be impossible for a manufacturer to plan an effective system of standardized equipment without help, both practical and informative, from the user.

*Manager, Mine Car Division, The Timken Roller Bearing Company.

Cooperation Between The Producing And Manufacturing Units Of The Mining Industry Has Brought About Standardized Equipment With Its Re- sultant Benefits To Each—Coopera- tion Is Necessary To Progress, Which In The Mining Industry Is Exemplified By The Present Steady Trend Toward Complete Mechanization

Still, the quality of standardization is, from the standpoint of the mine operator, one of the most valuable that a machine can possess. It is equally valuable, and for much the same reasons, to the manufacturer. The general advantages of mutual interchangeability of parts, which is what is implied by standardization, are pretty well recognized throughout industry. Owing to the conditions under which most equipment must operate in mining service, some of them gain added force, even to the extent of becoming necessities rather than advantages.

A good example of a practical application of the foregoing statements is ready to hand in the case of mine car-wheel bearings. Before the company with which the author is associated entered the mine-car field, an exhaustive study was made of the operating conditions and requirements which the bearings would have to meet. It became apparent, even early in the process, that some form of standardized mounting was

necessary if the effectiveness of the bearings was to reach its highest degree. Consequently such a mounting was developed for use on loose wheel cars, which is composed entirely of interchangeable parts, standardized over a wide range of axle diameters and car capacities. Various combinations of the parts can also be used for different types of axle mountings, such as extended axle, solid wheel inboard and outboard journal box, and different types of cannon-box mountings. One of the features of this standard mounting is the fact that only one special, but very simple, fixture is needed to assemble it at the mine, and none are required for emergency disassembly.

This may be considered as merely preliminary to a description of the advantages which, experience has shown, follow the adoption of standardized equipment. First, as far as the operator is concerned, he can carry a number of spare parts, either partially assembled, or disassembled, in stock. This relieves him of dependency on a distant supply, and consequent delays in replacement or repair. Second, if a wheel breaks, in the mine for example, it is a simple matter to replace it with a new one. Even if cars of several capacities are in use, all that is necessary is to know the capacity of the car that is broken down. Also the undamaged parts can be salvaged from the broken wheel and used

for future replacement. Emergency repairs can be made on an emergency basis. Third, since the method of assembly, as well as the parts, have been reduced to the simplest possible form, replacements and repair are rendered inexpensive as well as simple. No complicated fixtures are necessary to add to the fixed charges of the mine, and it is not essential to maintain a specially trained force to do the work. And, last but not least, standardization permits the manufacturer to produce both parts and complete assemblies on a quantity basis, with no extra expense for special fixtures, or patterns, or engineering development. Consequently he can sell at a reduced price to the further benefit of the operator.

These same considerations hold true, of course, in the case of any sort of equipment that has been standardized along lines laid down as the result of close cooperation between the user and the maker. The case of mine car wheels is cited principally because it comes within the writer's own experience. It might be said, however, that standardization that is not a result of cooperation is likely to be worse than useless. A complicated assembly, or undue delicacy of parts, or a multitude of small parts, can easily defeat the very purpose that was back of their design. It is only when each has a thorough knowledge of the other's problems and requirements that a really effective policy of standardization can be adopted.

Another important advantage of cooperation between manufacturer and operator is its effect on the problem of keeping equipment in good working order. Or, to put it more concisely, its effect on service. The operator considers, and rightfully, that he is entitled to a reasonable amount of service from the manufacturer. And, the manufacturer is usually the first to agree that his responsibility for the operation of the equipment by no means ceases on its delivery at the mine. But the effectiveness of the service depends entirely on the degree of cooperation existing between the two. Willingness on the part of the manufacturer to give service will not help a great deal unless the operator will do his part. And, naturally, the converse is also true. In either case the equipment suffers, and it is not long before the effects are felt by both the users and the makers.

On the other hand, where cooperation on this point does exist, the advantages to both are manifold. From one point of view, the effective life of the equipment is lengthened, and the quality of its service improved. Furthermore, the ultimate expense of its maintenance and operation is materially decreased. On the manufacturer's side, there is the opportunity to learn in what ways the de-

sign of the machine can be altered so that it will be more suitable for the work it is supposed to do. There is also the opportunity to learn from past experience what to avoid and what to include in the construction or design of new forms of equipment. These factors are brought out forcibly by experience obtained in the early days of the standardized wheel mounting already referred to. When this mounting was first designed, the dust collar between the wheel and the axle bracket was given a tapered bore. After several thousand cars had been put in service, it was found that the chucking of the wheels on the track tended to loosen the collar, and thus caused undue wear both of the collar and of the axle. This fact formed the basis for a complete change in the standard design, in which the taper bore of the collar was done away with, and a straight bore adopted. The change eliminated the trouble before it had reached serious proportions. Existing assemblies throughout the entire field were changed over from the taper to the straight bore construction without expense to the operators.

It is manifestly impossible to go into details as to all the advantages that follow the exercise of an active spirit of cooperation between operators and manufacturers. Nor is it necessary; the two that have been described should be enough to show both the importance and value of cooperation. The whole situation can be summed up in a sentence. Cooperation is necessary to progress, and an industry that is not progressing is sliding backwards. There is no middle course.

COAL OPERATORS' MEETING

(Continued from page 222)

the number of papers at any one session limited, all papers presented in ten minutes, with papers printed in advance, and the chairman instructed to enforce the rules, the result should be an interesting, lively and constructive meeting.

The Cincinnati Coal Exchange and the Cincinnati Chamber of Commerce are arranging special entertainment features, including privilege of the Cincinnati golf clubs, a special tea for the visiting ladies, and an informal dinner. There will also be a prize fight staged at Music Hall on Wednesday evening, May 9.

The exposition, which is held annually in conjunction with the convention, will be by far the most comprehensive exhibit of machinery for the mine yet held. Among those who will display their equipment are the following:

Ahlberg Bearing Co., Allen & Garcia Co., American Car & Foundry Co., American Cast Iron Pipe Co., American Mining Congress (Headquarters and registration), American Rheolaveur Corp.,

American Wood Imp. Corp., Ames Shovel & Tool Co., Atlas Powder Co.

Baldwin Locomotive Works, Bethlehem Steel Co. (Inc.), Broderick & Bascom Rope Co., The Brown-Fayro Co.

Carnegie Steel Co., Central Frog & Switch Co., Chance Coal Cleaner, Chicago Pneumatic Tool Co., Coal Mine Management, Concordia Electric Co., The Coloder Company, Conveyor Sales Co., Curtin-Howe Co.

Deister Concentrator Co., G. R. Delamater, The Deming Co., Dravo Doyle Co., E. I. du Pont de Nemours & Co. (Inc.).

Eagle Iron Works, Edison Storage Battery Co., The Electric Railway Equipment Co., The Electric Railway Implement Co., The Electric Storage Battery Co., Enterprise Wheel and Car Corp.

Fairbanks, Morse & Co., Flood City Brass & Electric Co., Fort Pitt Mine Equipment Co., Frederick Iron and Steel Co., General Electric Co., Goodman Manufacturing Co., Grasselli Powder Co.

Hendrick Manufacturing Co., Hercules Powder Co. (Inc.), Hockensmith Wheel and Mine Car Co., Hulburt Oil and Grease Co., Hyatt Roller Bearing Co.

Ideal Commutator Dresser Co., Ironton Engine Co., Jeffrey Manufacturing Co., Joy Manufacturing Co., Keystone Lubricating Co.

LaBour Company, Laughlin Filter Corp., A. Leschen & Sons Rope Co., Lincoln Steel and Forge Co., Link-Belt Company, Lorain Steel Co.

Martindale Electric Co., McGraw-Hill Catalog and Directory Co., Mining Engineering Co. (Ltd.), Mine Safety Appliances Co., Mining Safety Device Co.

Modern Mining Publishing Co., Morrow Manufacturing Co., Myers-Whaley Co. (Inc.), National Carbon Co. (Inc.), National Malleable and Steel Castings Co., Niagara Concrete Mixer Co., R. D. Nuttall Co.

Ohio Brass Co., Orville Simpson Co., Osborne Register Co.

Pennsylvania Crusher Co., Phillips Mine and Mill Supply Co., Pittsburgh Coal Washer Co., Pittsburgh Knife and Forge Co., Portable Lamp and Equipment Co., Post Glover Electric Co., Pure Oil Co.

Roberts and Schaefer Co., Robinson Ventilating Co., John A. Roebling's Sons Co., Rome Wire Co.

Safety Mining Co., Sanford-Day Iron Works (Inc.), Simplex Wire and Cable Co., S K F Industries (Inc.), Streeter-Amet Weighing and Recording Co., Sullivan Machinery Co.

Templeton, Kenly & Co. (Ltd.), Timken Roller Bearing Co., Tool Steel Gear and Pinion Co., Traylor Vibrator Co., W. S. Tyler Co., U. S. Bureau of Mines.

Watt Car and Wheel Co., Waverly Oil Works Co., Weinman Pump Manufacturing Co., Weir Kilby Corporation, Westinghouse Electric and Manufacturing Co., West Virginia Rail Co.



A. S. Bum.

LEGISLATIVE REVIEW

LEGISLATION for consolidation of mining companies and selling agencies in the coal industry may develop in Congress as an outcome of the present investigation of the bituminous industry. Since the Senate Committee on Interstate Commerce has been looking into the situation growing out of the year's suspension in bituminous union mines, sentiment has been developing in the committee for a commission on the order of the Interstate Commerce Commission to supervise consolidated mining groups and selling agencies in the interest of affording producers and miners reasonable profits and wages and more regular operation and employment. Several witnesses before the committee and some Senators on the investigating body have expressed themselves in favor of some legislation along

Coal Inquiry May Develop Legislation Creating Coal Board Similar To I. C. C.—War Mineral Court Appeal Favored—Government Operation Of Nitrate And Power Plants At Muscle Shoals—Increased Mine Fund

this line as a solution of the present difficulties in the industry. The committee has been holding two sessions daily and is not hurrying the proceedings because of a desire to get at all the facts in the charges brought by the union which form the basis for the inquiry. Next to the naval oil reserve lease investigation, the coal hearing is the most spectacular of the proceedings in Congress at this time. The miners union has had the spotlight, putting a number of witnesses on the stand to prove its contentions. The union is pressing its charge that the leading oper-

ators broke the wage agreement and is filling in with testimony as to the suffering of the miners and their families. Assault has also been made on court injunctions against the union and the coal buying policies of railroads, which, it is claimed, are detrimental to union mines. As the operators and railroads will be given opportunity to refute these charges, the inquiry promises to be a long drawn out affair. At times the investigation has all the appearance of a court scene. Witnesses are required to take an oath and are subject to a cross fire of questions from members of the committee and attorneys for the union, operators and railroads. John L. Lewis, president, and Philip Murray, vice president, and lesser officials of the union are in daily attendance, while Secretary of Labor Davis and former Secretary Wil-

son have frequently been on hand. The large committee room in the Senate Office Building is invariably crowded with persons interested in the coal industry and by the general public. To afford relief to the families of miners and of others unemployed, bills were introduced appropriating from 25 to 75 million dollars.

Coal freight rates have also been before Congress. Incensed over refusal of the Interstate Commerce Commission to allow railroads to reduce rates on coal from southern mines to the Great Lakes, and claiming that he was in part responsible for it, southern Senators brought about the defeat of John J. Esch for reappointment to the Interstate Commerce Commission. The same group a year ago defeated Cyrus K. Woods, of Pennsylvania for appointment to the Commission. Senator Sackett, Republican, Kentucky, introduced a resolution for investigation by the Interstate Commerce Commission of freight rates on coal from Pennsylvania, Ohio, Virginia, West Virginia, Kentucky and Tennessee. The committee, however, has been too busy with the strike inquiry to consider the rate question.

Demand was made in a Senate bill for repeal of the Hoch-Smith act of January 30, 1925, under which the Interstate Commerce Commission is authorized to readjust the freight rate structure.

Congress enacted and the President approved a law granting a two-year extension of coal prospecting permits in cases where the holders have been unable to meet the present requirements.

Legislation in behalf of metal mining interests has also received consideration. The bill to permit war mineral claimants to appeal to the Court of Claims has been reported by the House Mines and Mining Committee, a similar bill having recently been passed by the Senate. Increased appropriations for the experiment stations of the Bureau of Mines are proposed in a bill introduced in the House.

While other bills of a similar character remain unacted on in committee, another Blue Sky bill made its appearance in the House. A bill to lease gilsonite lands was reported by the House Public Lands Committee, to which has been referred a new bill amending the leasing law regarding permits and leases for chlorides, borates and silicates. A law was enacted to permit New Mexico to dispose of by lease or contracts minerals in lands under a grant made in 1920. Both Senate and House passed a bill authorizing a two-year extension of oil and gas permits in cases where the present law requirements have not been observed. The Senate passed a bill to prevent over-production of oil, by reducing the acreage to be leased annually

or to suspend leases on Indian lands in Oklahoma for two years.

Bills were reported by both Senate and House committees to create a division of safety in the Department of Labor and to prevent interstate commerce in goods mined or manufactured by convict labor. When the safety bills were reached on the calendar by the Senate and House they were objected to by members and action deferred. Senator Bayard, Democrat, Delaware, said the bill is unnecessary as the states are taking care of safety matters.

The Federal Trade Commission has begun an investigation of electric public utility corporations under a resolution adopted by the Senate. Electric power generated at the Muscle Shoals, Ala., nitrate and power project will be distributed by the War Department under contract, by the terms of a resolution passed by the Senate. Another power project before Congress is the Colorado River development bill, which has been reported by House and Senate Committees.

Hearings were held by Senate and House Immigration Committees on proposals to restrict immigration from Canada and other countries of North America. Mining, railroad and agricultural interests opposed this action, as did also the State, Interior and Agricultural Departments on the ground that it would injure friendly relations with these countries and deprive the country of necessary workers.

The following is a summary of new bills introduced and action on other bills during the month:

BLUE SKY

H. R. 11462. Mr. Dempsey (Rep., N. Y.). This bill seeks to regulate, through the Department of Justice, the sale through the mails of certificates in an oil, gas, or mining lease. Judiciary.

H. R. 11806. Mr. Strong (Rep., Kans.). This bill seeks to stabilize the gold standard under the Federal Reserve Board, by subjecting the purchasing power of the dollar to changes in commodity prices. Banking.

H. Con. Res. 21. Mr. White (Dem., Colo.), by request. This bill provides for the scientific determination of values for revenue purposes by the Bureau of Standards, including stabilization of the purchasing power of the gold dollar based on commodity prices. It appropriated \$25,000. Coinage.

H. R. 11411. Mr. Winter (Rep., Wyo.). This bill allows appeals of war mineral claimants to the Court of Claims for six months after its passage, or decision of their claims by the Interior Department. It limits attorney fees of claimants to 10 percent, or not more than \$25,000 in any one case. Reported by Mines and Mining Committee.

H. R. 11531. Mr. Englebright (Rep., Calif.). This bill makes annual appropriations of \$448,000 for experiment stations of the Bureau of Mines. Mines and Mining.

LEASING LAW

S. 3375. Mr. Oddie (Rep., Nev.), and H. R. 10885, Mr. Arentz (Rep., Nev.). These bills amend the leasing law regarding prospecting permits and leases for chlorides, sulphates, carbonates, borates, silicates, or nitrates of sodium. The bill would apply to lands in San Bernardino County, Calif., which are now exempted from the leasing law. It also eliminates the provision as to "dissolved in and soluble in water and accumulated by concentration." A lease would be given to all of the land under the permit, instead of half of the land as now provided. The new royalty provision calls for payment to the Government of 2 percent of the value of the output instead of one-eighth of the gross value of the production under the present law. The bill provides for advance rentals of 25 cents an acre for the first year, 50 cents for the second, and \$1 for subsequent years. The present law calls for 50 cents for the first year and \$1 per year thereafter. The bill provides for 20-year leases, while the present law provides for indefinite leases. Public Lands.

H. R. 68. This bill authorizes the Interior Department to grant prospecting permits and leases for asphalt, gilsonite, elaterite, and other like substances on public lands. The permits would be for two years for 640 acres and the leases for 20 years for a like acreage at a royalty of 50 cents per ton and an advance rental of 50 cents per acre per year. Reported by Public Lands Committee.

H. R. 117. This bill provides for payment of costs of flood control on the Sacramento River equally by the Government, California, and the land owners. This legislation grows out of the hydraulic mining situation. Reported by Flood Committee.

H. R. 8927. This bill permits combinations in potash and other raw materials to permit competition with foreign monopolies. Reported by Judiciary Committee.

S. 3309. Mr. Nye (Rep., N. Dak.); and H. R. 11020, Mr. Sinnott (Rep., Oreg.). These bills validate the following land entries: Mineral entry of the Pacific Portland Cement Company in the Carson City, Nev., land district in 1925 for the empire mill site; mineral entry of the Pioneer Gold Dredging Co., in the Fairbanks, Alaska, district, and an entry of the Columbia Oil Shale and Refining Co. in Colorado at \$1.25 per acre, reserving oil, coal, and other minerals in the land to the Government. Public Lands. The House passed H. R. 11020.

H. R. 11580. Mr. Leavitt (Rep., Mont.); and S. 3593, Mr. Wheeler (Dem., Mont.). These bills authorize the lease or sale of lands reserved for agency school and other purposes on the Fort Peck, Mont., Indian Reservation. In the sale of lands, the mineral rights are to be reserved by the Indians. Indian Affairs.

COAL INQUIRY

S. Res. 105. This resolution provides for investigation of conditions in the coal fields of central and western Pennsylvania, West Virginia and Ohio. It appropriates \$10,000. Passed by Senate. The inquiry is being conducted by the Senate Interstate Commerce Committee, which is making a thorough and complete investigation of the conditions existing in these coal fields to ascertain whether railroads and their officials have been or are, by agreement or otherwise, endeavoring to depress the labor cost of coal produced by union mine labor; whether wage contracts have been abrogated or repudiated, defenseless men, women, and children, without cause, have been evicted from their homes, and generally what had transpired in these coal fields, and the reasons for conditions and happenings therein. The investigation is also to ascertain whether in industrial disputes or strikes in these coal fields injunctions have been issued in violation of constitutional rights, and whether by injunction or otherwise the rights granted by the Constitution have been abrogated and denied.

COAL FREIGHT RATES

S. Res. 150. Mr. Sackett (Rep., Ky.). This resolution proposes an investigation by the Senate Interstate Commerce Committee of freight rates on bituminous, particularly in relation to Pennsylvania, Ohio, West Virginia, Virginia, Kentucky, and Tennessee. The resolution provides that the committee shall make an investigation of the existing rate structures of freight rates on bituminous coal moving in interstate commerce to determine whether there exist injustices and unfairness therein and whether any mining district are being unfairly or abnormally stimulated and overdeveloped or are being depressed thereby; to investigate and ascertain the power, authority, and practices of the Interstate Commerce Commission under existing law to control the minimum freight rates to be charged by railroads for the purpose or with the effect of increasing or preventing competition between mining districts located in different states by equalizing the costs of production and distribution in industry through the requirement of transportation charges upon bituminous coal that are more than compensatory to the carriers performing the services of distribution; and particularly to investigate

and ascertain the effect on the bituminous coal industry and coal-mining districts of Pennsylvania, Ohio, West Virginia, Virginia, Kentucky, and Tennessee of the orders of the Interstate Commerce Commission for the reduction or refusal to permit the reduction of freight rates on bituminous coal by carriers serving said states. Interstate Commerce.

S. 1455. This bill authorizes a two-year extension of coal prospecting permits under the leasing law where the holders have been unable to meet the requirements of existing law as to operations thereunder. Enacted into law.

STRIKE RELIEF

S. 3610. Mr. Wheeler (Dem., Mont.); and H. R. 11986. Mr. La Guardia (Rep., N. Y.). These bills propose Federal appropriations for relief of children in distress caused by strikes, such as the present bituminous suspension, of children of others unemployed, and of other parents in extreme poverty, including children of farmers. Food, clothing, and cash would be disbursed through existing agencies under a board consisting of the Secretaries of Labor and Agriculture and the Chief of the Children's Bureau of the Department of Labor. The Wheeler bill appropriates \$25,000,000 and the La Guardia bill \$75,000,000. The Senate bill was referred to the Labor Committee and the House bill to the Judiciary Committee.

S. 1959. This bill transfers jurisdiction over leases in the naval oil reserves

from the Interior to the Navy Department. Enacted into law.

H. R. 11617. Mr. Butler (Rep., Pa.). This bill provides for the conservation, care, and operation of naval oil and oil-shale reserves by the Navy Department. It authorizes the refining of crude petroleum; limits exchange of products to crude petroleum for refined products; stored petroleum products shall not be used or otherwise disposed of except in war or national emergency, unless to avoid their deterioration or when the President deems the prices for current naval needs are unreasonable; for transfer of leases between Government and private owners to avoid drainage of Government reserves by private lands; and operation or lease of the oil and oil-shale reserves by the department. Naval Affairs.

H. R. 12065. Mr. Garrett (Dem., Tenn.). This bill creates a Conservation Department, whose duties will include the minimizing or elimination of pollution of waters detrimental to wild animal life. Executive Departments.

OIL PERMITS

H. R. 5783. This bill grants a two-year extension of oil and gas prospecting permits where the holders have been unable to comply with the present law as to beginning drilling operations, to drill to the depth required or have failed to discover oil or gas. Enacted into law.

H. R. 8331. This bill authorizes the collection by the Interior Department of a

IMPORTANT BILLS REVIEWED IN THIS ISSUE

Mining

H. R. 11442—Dampney (R., N. Y.). Blue Sky.
H. R. 11894—Strong (R., Kans.). Dollar Standard.
H. Cen. Res. 21—White (D., Colo.). Value Inquiry.
H. R. 11411—Reported by Committee. War Minerals.
H. R. 11531—Englebright (R., Calif.). Experiment Stations.
H. R. 68—Reported by Committee. Gilsenite Leases.

Coal

S. Res. 105—Passed by Senate. Strike Inquiry.
S. Res. 150—Sackett (R., Ky.). Rate Inquiry.
S. 1455—Enacted into Law. Prospecting Permits.
S. 3610—Wheeler (D., Mont.). Strike Relief.

Oil

H. R. 11617—Butler (R., Pa.). Reserve Supervision.
H. R. 5783—Enacted into law. Permit Extension.

Transportation

S. 3414—Glass (D., Va.). Rate Structure.
H. R. 11529—Sutherland (R., Alaska). Alaska Railroad.

Labor

S. 1246—Reported by Committee. Convict Goods.
H. R. 7729—Reported by Committee. Safety Division.

Industrial

S. Res. 83—Passed by Senate. Power Inquiry.
H. J. Res. 160—Passed by House. Armor Plate.
S. J. Res. 46—Passed by Senate. Muscle Shoals.

Immigration

H. R. 10955—Allgood (D., Ala.). Mexican Restriction.
H. R. 11924—Kelly (R., Pa.). Naturalization Standards.

3 percent fee from Indian lessors on royalties from production on mining leases on restricted Indian lands. The fund is to be used in supervising, developing, and operating the leases. The bill will not apply to tribal coal and asphalt deposits owned by the Choctaw and Chickasaw Indians. Passed by the House and reported by the Senate Indian Committee.

H. R. 356. This bill extends for 10 years from July 1, 1927, the time to make entry and payment for mineral lands on the Shoshone or Wind River Indian Reservation, Wyoming, located under the act of March 3, 1905. The extension will not apply to coal, oil or gas lands. Passed by the House and reported by the Senate Indian Committee.

S. 3594. Mr. Frazier (Rep., N. Dak.); and H. R. 12000, Mr. Leavitt (Rep., Mont.), by request of the Interior Department. These bills extend the restrictions on lands of the Five Civilized Indian Tribes in Oklahoma for 25 years from April 26, 1931. Minerals produced on these lands after that date shall be subject to state and Federal taxes. Indian Affairs.

H. R. 8527. This bill authorizes the International Petroleum Company of Canada to sue the Government for damages to one of its vessels caused by collision of a Government vessel. Enacted into law.

S. 3669. Mr. Howell (Rep., Nebr.); and H. R. 11995. Mr. Butler (Rep., Pa.). These bills propose to pay \$7,356 to settle damage claims growing out of construction of the Petrolia-Fort Worth gas pipe line. Claims and Naval Affairs.

H. R. 12057. Mr. Morin (Rep., Pa.). This bill refers to the Court of Claims a claim of the Mack Copper Company for damage to its property in San Diego County, Calif., used by the Government from 1917 to 1922. War Claims.

RATE ADJUSTMENTS

S. 3414. Mr. Glass (Dem., Va.). This bill repeals the Hoch-Smith act of Congress of January 30, 1925, authorizing the Interstate Commerce Commission to readjust the freight rate structure. Interstate Commerce.

S. 3529. Mr. Neely (Dem., W. Va.). This bill limits the terms of Interstate Commerce Commissioners to eight years. Interstate Commerce.

H. R. 11529. Mr. Sutherland (Rep., Alaska). This bill grants the Alaska Anthracite Railroad Company three years from passage of this bill to complete its main line and branches, and exempting the company from license tax for four years from its passage. Territories.

H. R. 10758. Mr. Ayres (Dem., Kans.). This bill reduces tariff duties on various iron, steel, aluminum, and copper articles. Ways and Means.

H. R. 12206. Mr. Linthicum (Dem., Md.); and S. 3400. Mr. Tydings (Dem., Md.). These bills exempt crude phosphate of lime or phosphate rock, crude salts of potash and nitrate of soda, mined or quarried and in a raw state used for plant food, from special dumping duty under the tariff law. Ways and Means and Finance.

H. R. 1. Amendment to by Mr. Stephens (Dem., Miss.). This amendment to the tax revision bill continues the present provision regarding distributions by corporations. Finance.

COINAGE BILLS

H. R. 81. This bill authorizes the coinage of 10,000 fifty-cent silver pieces in celebration of the 150th anniversary of the discovery of Hawaii. Enacted into law.

S. 3316. Mr. Shipstead (Rep., Minn.); and H. R. 11078, Mr. Kvale (Rep., Minn.). These bills provide for the coinage of 10,000,000 medals in honor of Colonel Charles A. Lindbergh. The House bill has been reported by the Coinage Committee.

H. R. 10962. Mr. Allgood (Dem., Ala.). This bill proposes to coin \$20,000,000 worth of silver 50-cent pieces in honor of Colonel Lindbergh. Coinage.

H. R. 11028. Mr. Holaday (Rep., Ill.). This bill proposes to coin 2,000,000 silver 50-cent pieces in memory of the late Speaker Cannon of the House of Representatives. Coinage.

H. R. 7729 and S. 1940. These bills subjects to the laws of the states into which they are shipped goods mined or manufactured by convict labor. The law would be effective from two years after its passage. Reported by House Labor and Senate Interstate Commerce Committees.

S. 1266 and H. R. 6848. These bills propose to create within the Bureau of Labor Statistics of the Department of Labor a Division of Safety to advance safety in industries. Reported by the Senate and House Labor Committees.

UTILITY INQUIRY

S. Res. 83. This resolution directs the Federal Trade Commission to investigate electric public utility corporations doing an interstate or international business. The inquiry will cover the following points: growth of capital assets and liabilities; method of issuance, price and commissions on securities; stock or financial interests of holding companies in financial, engineering, construction and management corporations; whether these corporations have made efforts to influence or control public opinion on municipal or public ownership of electrical generation and distribution; whether any of these practices tend to create a monopoly or violate the anti-trust laws; services furnished to public

utility corporations by holding companies; and the value or detriment to the public of holding companies in the electric power industry. The commission is to report legislation to correct abuses in the organization or operation of holding companies. Passed by Senate.

H. R. 5746. This bill provides for the sale of the plant for furnishing electric current to the naval ordnance plant at South Charleston, W. Va. Passed by House.

H. J. Res. 160. This resolution calls on the Navy Department for a report as to whether armor plate can be purchased from private concerns cheaper than it can be manufactured at the Government armor plate plant at South Charleston, W. Va. It also calls for a report as to whether this plant shall be operated by the Government or leased or sold to a private manufacturer. Passed by House.

H. Res. 123. Mr. Kindred (Dem., N. Y.). This resolution provides for an investigation by five members of the House of acts of the Federal Trade Commission, especially with reference to the aluminum and other trusts dealing in household commodities. Rules.

H. R. 11353. Mr. Welch (Rep., Calif.). This bill calls for an investigation by the Interstate Commerce Commission as to the reasonableness of charges by the Western Electric Co. to the American Telephone & Telegraph Co. for materials, supplies, equipment and service. It appropriates \$40,000. Interstate Commerce.

H. J. Res. 218. Mr. Schafer (Rep., Wis.). This resolution provides that Congress shall pass on applications for power development on Wolf River in the Menominee Indian Reservation, Wisconsin. Interstate Commerce.

POWER DEVELOPMENT

S. J. Res. 46. This resolution provides for Government operation of the Muscle Shoals, Ala., nitrate and power project. It authorizes the Department of Agriculture to operate experimental or production plants anywhere in the country for the manufacture and distribution of fertilizer. Experiments are authorized in the production of fertilizer by the cyanamide process, and if found commercially feasible, their production by that process is authorized. Provision is made for equitable distribution of surplus power for 10-year periods by the War Department to states, counties, municipalities, corporations, partnerships or individuals over Government transmission lines. Contracts for the sale of power to states, counties, cities or public or cooperative organizations of citizens not organized for profit, shall be for 15 years, the transmission lines to be provided by these organizations. Other surplus power may be sold to persons or corporations distributing or re-

selling electricity for profit and shall be sold to consumers at prices fixed by the Federal Power Commission. The resolution appropriates \$10,000,000. Passed by the Senate.

S. 3177. Mr. Phipps (Rep., Colo.). This bill provides for development of the Colorado River for navigation, irrigation and power purposes. It appropriates \$125,000,000 for a storage dam at Black or Boulder Canyon. Irrigation.

S. 3332. Mr. McNary (Rep., Ore.) and H. R. 10886, Mr. Sinnott (Rep., Ore.). These bills authorize the Oregon District Court or the Court of Claims to consider a suit of Oregon to set aside a contract between the Government and the California-Oregon Power Co., made in 1917, regarding power rights on the Leavitt power site. Irrigation.

H. R. 11526. Mr. Butler (Rep., Pa.). This bill authorizes the construction during each of the next three years five light cruisers costing \$17,000,000 each and one aircraft carrier costing \$19,000,000, including armor and armament. The armor for half of the vessels is to be produced at the Government plant at Charleston, W. Va. Passed by House.

IMMIGRATION RESTRICTION

H. R. 10955. Mr. Allgood (Dem., Ala.). This bill applies the immigration quota restriction law to Mexico, Cuba, Haiti, Dominican Republic, Canal Zone, Canada and Newfoundland. Immigration.

H. J. Res. 246. Mr. Schneider (Rep., Wis.), and S. J. Res. 113. Mr. Johnson (Rep., Calif.). These resolutions extend until 1929, the national origin method of determining immigration quotas. Immigration. The Senate resolution has been reported by the committee.

H. R. 11271. Mr. Goodwin (Dem., N. C.). This bill abolishes the national origin method of determining immigration quotas. Immigration.

H. R. 11982. Mr. Hudspeth (Dem., Tex.). This bill provides a border patrol of from 950 to 1,350 inspectors to enforce immigration laws on the boundary between Mexico, Canada and elsewhere. It appropriates \$2,000,000. Immigration.

H. R. 11687. Mr. Box (Dem., Tex.). This bill provides a border patrol of 650 inspectors on the Mexican boundary. Immigration.

H. R. 11955. Mr. Gibson (Rep., Vt.). This bill appropriates \$4,000,000 for buildings for the immigration and customs service on the Canadian and Mexican borders. Public Buildings.

H. R. 11924. Mr. Kelly (Rep., Pa.). This bill seeks to establish a more adequate standard for admission of aliens to American citizenship. It provides: "That an intelligent reading as well as speaking knowledge of the English language shall be required of aliens before filing petitions for naturalization, and that a reasonable understanding of American

MEDALS COMMEMORATE HEROISM IN MINE DISASTERS

HEROISM and resourcefulness on the part of 15 American miners, whose prompt action in the face of extreme peril resulted in the saving of the lives of a number of underground workers, were recognized by the award of appropriate medals by the Joseph A. Holmes Safety Association on the occasion of the annual meeting of officials of the Association recently held in Washington. Gold medals, given only for performance of an act in which one's own life is risked, and which results in the saving of human life, were bestowed on Piere Du Pree and Lewis Thompson, of Krebs, Okla., and David J. Roach, of Cokeburg, Pa. Silver medals for assisting in saving life, at personal risk, were given to Samuel Cooley and H. H. Henderson, Cokeburg, Pa. A bronze medal, for the giving of warning of impending danger at personal risk, was awarded to Hector McNeil, Henryetta, Okla. Bronze medals, for attempting to save the life of another at great personal risk, were given to A. Orten, Daniel Seed, Thomas Matthews, Harry Hoover, Thomas Mason, Basil Wallman, Earl Skinner, Thomas Tyson and H. M. Hansen, all of Lowell, Ariz.

At the same time the Association, which is closely affiliated with the Bureau of Mines, awarded certificates of honor to 7 mines and 2 quarries in recognition of especially meritorious mine-safety accomplishments. For the application of exceptional safety methods in connection with mining operations, at its No. 6 mine, a certificate of honor was awarded to the Stag Canon Branch of the Phelps Dodge Corporation at Dawson, N. Mex. Certificates of honor, in recognition of remarkable safety records, were awarded to the Stewart coal mine, of W. J. Rainey, Inc., Southwest, Pa.; the Logans Ferry mine, of the Allegheny Pittsburgh Coal Co., Logans Ferry, Pa.; the Robinson No. 1 coal mine, of the Colorado Fuel & Iron Co., Walsenburg, Colo.; the Negaunee mine, of the Cleveland Cliffs Iron Co., Negaunee, Mich.; the Bristol iron mine, of the Bristol Mining Co., Crystal Falls, Mich.; the Albany iron mine of Pickands Mather Co., Hibbing, Minn.; the Genoa Plant, of the United States Gypsum Co., Genoa, Ohio; and the Cowell Plant, of the Cowell Portland Cement Co., Cowell, Calif.

Piere Du Pree and Lewis Thompson were given gold medals in recognition of their action in the progress of a fire in No. 5 mine of the Osage Coal Co., Krebs, Okla., March 15, 1927. After the fire had raged for 3 days, one of the fire bosses, Mike McCann, attempted to make an exploration of the mine, but was not heard from. Thompson, with two others, entered the mine in search of the missing fire boss. McCann was found, in an unconscious state, far back in the mine. Thompson administered artificial respiration to the prostrate man, while the other two members of the party went to procure an empty car to transport him from the mine. Thompson, succeeding in restoration of breathing to McCann, became himself on the point of collapse, and was obliged to leave McCann to find the other two men. He became unconscious, but he and McCann were rescued. Piere Du Pree, learning of the situation within the mine, rushed in and located the unconscious form of John Paterson, an assistant pit boss, who had collapsed while dragging the exhausted Thompson to safety. Du Pree procured an empty car and with the aid of two men brought Paterson to the surface, a distance of 1,100 ft.

The gold medal was awarded to David J. Roach and silver medals to Samuel Cooley and H. H. Henderson, because of their courage and skill exercised following an explosion in the Cokeburg coal mine, Cokeburg, Pa., April 2, 1927. Upon hearing calls for help from miners who were within the explosion zone, these three men rushed to their assistance, and in so doing they saved the lives of three miners.

history, institutions, and ideals shall be required of petitioners for naturalization before being admitted to citizenship; such knowledge and understanding to be certified by diplomas issued by public school authorities in accordance with standards and regulations prescribed by the Secretary of Labor with the cooperation of the Secretary of the Interior, or in lieu thereof, by a written examination based upon said standards and regulations conducted by the naturalization examiner." Immigration.

H. R. 7029. This bill provides for development of the Columbia River reclamation project. Reported by Immigration

Committee. The report of the committee quotes from a letter of President Coolidge to the convention of the American Mining Congress at Sacramento in 1924 as to possibilities of power development on the river.

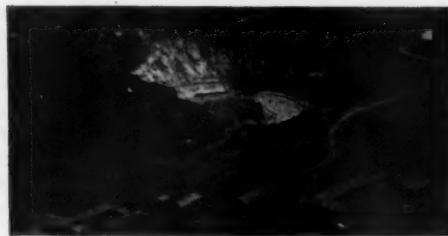
S. 3585. Mr. Howell (Rep., Nebr.). This bill provides for transportation service on the Missouri River by vessels of the Inland Waterways Corporation under the War Department. Commerce.

H. J. Res. 240. Mr. Golder (Rep., Pa.). This resolution proposes a constitutional amendment to abolish immunity of Members of Congress for what they may say against persons in speeches in Congress.

PRACTICAL OPERATING MEN'S DEPARTMENT METALS

GUY N. BJORGE
Editor

*Practical Operating Problems
of the Metal Mining Industry*



The KATHERINE MILL and CYANIDE PLANT

By EUGENE IRELAND*

THE Katherine Gold Mining Company's mine and mill are located in Mohave County, Ariz., 35 miles west of Kingman, the county seat and nearest railroad shipping point, and two miles from the Colorado River.

The mine has been known to exist for about 25 years. While considerable had been done at various times in the past, active exploration was not begun by the present company, the Katherine Gold Mining Company of Delaware, until 1919. Sufficient ore was disclosed by 1924 to warrant the erection of a mill. At present writing the mine has been opened to

* Mill Superintendent, Katherine Gold Mining Company, Mojave County, Ariz.

*Daily Average Tonnage Of
Two Hundred Sixty Tons
With Average Extraction Of
94.94 Percent—A Detailed
Description Of Mill Which In
1927 Operated 97 Percent Of
Possible Running Time*

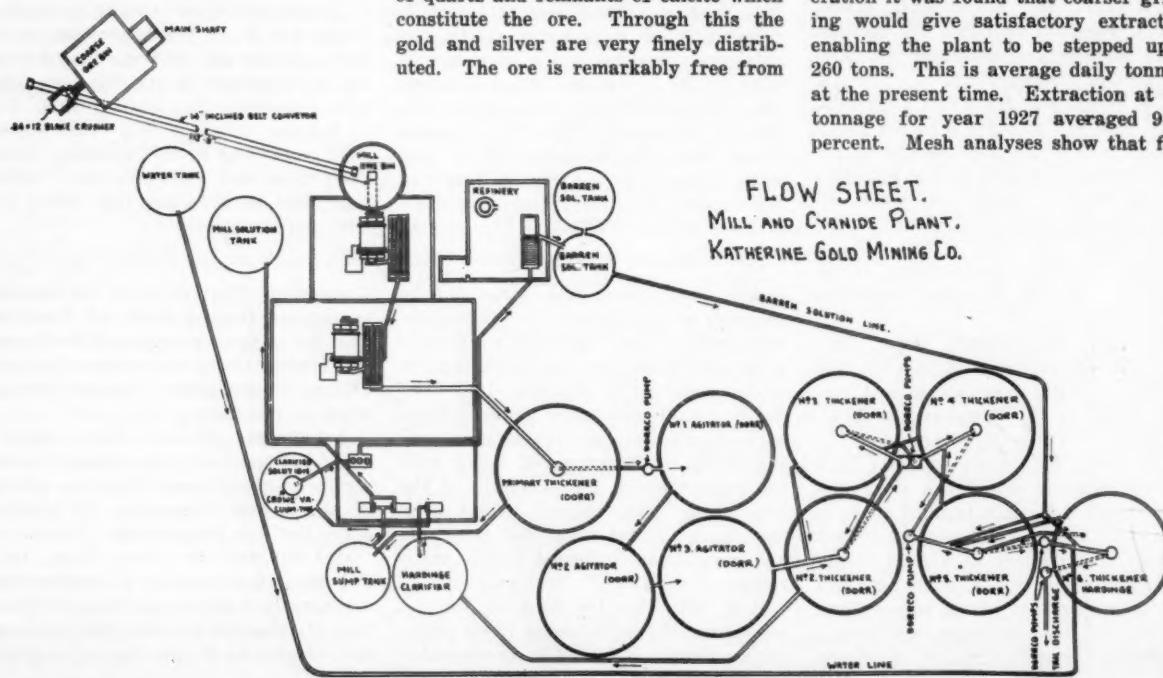
a depth of 900 ft. with levels at 100-ft. intervals.

The veins occur in a large shear zone in pre-Cambrian granite, and were evidently formed in stages. First there was a deposition of glassy quartz; in second stage crystallized calcite; and in third stage this calcite was largely replaced by quartz. It is this aggregate of quartz and remnants of calcite which constitute the ore. Through this the gold and silver are very finely distributed. The ore is remarkably free from

other minerals and is ideal for cyanide treatment.

In 1924 the writer was authorized to design and erect a mill and cyanide plant. Tests proved the ore readily amenable to cyanide treatment and ideal for an all-sliming and countercurrent decantation plant. These tests tended to show that the ore would have to be ground fairly fine; that is, to at least 75 to 80 percent minus 200 mesh. Also, that cyanide strength should be at least 1.5 lbs. per ton of solution in the agitators. Practice proved the tests to be wrong.

With these tests in mind the mill described below was erected to treat 150 tons per day. After a few months' operation it was found that coarser grinding would give satisfactory extraction, enabling the plant to be stepped up to 260 tons. This is average daily tonnage at the present time. Extraction at this tonnage for year 1927 averaged 94.94 percent. Mesh analyses show that finer



FLOW SHEET.
MILL AND CYANIDE PLANT.
KATHERINE GOLD MINING CO.

grinding would give higher extraction. The following is typical mesh analysis of tailing pulp:

	Mesh	Percent	Value
Plus	80	23	\$0.41
Plus	100	5	0.31
Plus	150	10	0.31
Plus	200	12	0.10
Minus	200	80	6.10

However, it was soon established that a tonnage of 260 per day with an extraction of 95 percent was most economical. The cyanide plant handled the increased tonnage without trouble. With the coarse feed the thickeners and agitators are receiving, it is necessary to keep the pulp moving all of the time. Thanks to steady power this is possible.

The following is a description of the mill as it stands today:

Ore from the mine, which will all pass an 8-in. grizzly, is hoisted in skips to an inclined bottom coarse ore bin. This bin discharges through a rack and pinion gate over a 1½-in. spaced grizzly, inclined at an angle of 37 degrees, to a 24 by 12 Blake type Allis-Chalmers crusher set to deliver a 2½-in. ring



Surface at Katherine Gold Mining Company showing power plant, head frame, conveyor, etc.

	Percent
Plus 20 mesh.....	7.50
Plus 40 mesh.....	22.00
Plus 80 mesh.....	24.50
Plus 100 mesh.....	3.50
Plus 150 mesh.....	6.50
Plus 200 mesh.....	7.00
Minus 200 mesh.....	29.00

Five-inch forged steel balls and manganese steel ship lap type liners are used in this mill. Ball consumption in 1927

Overflow from second classifier flows to the primary thickener of the cyanide plant. Cyanide plant consists of one 30 by 10-ft. primary thickener, three 28 by 14-ft. Dorr agitators, four 28 by 10-ft. Dorr thickeners, and one 28 by 10 Hardinge super-thickener in the countercurrent series.

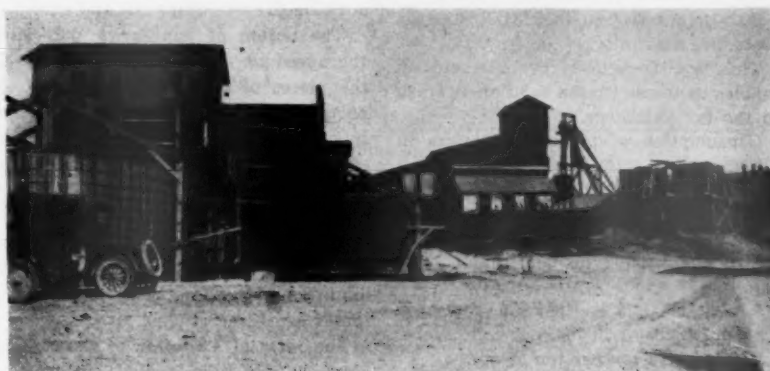
Pulp from the primary thickener is pumped by a No. 4 Dorrco suction pump to the first agitator at average density of 1 to 1. Pulp in agitators is diluted to about 47 percent solids.

Agitation is continuous. Pulp from last agitator flows to the first and second thickeners of the countercurrent system, 85 percent to the first and 15 percent to the second. The object here is to insure a clear overflow at all times from the first thickener. The pulp is pumped from one thickener to the next in the series by No. 4 Dorrco suction pumps and finally out of the last or tail thickener. This is the Hardinge. Pulp discharging from the Dorr thickeners is maintained at an average density of 47 percent solids and from the Hardinge at 60 percent solids.

Water wash and one-half of barren solution wash is added to the last thickener, the other half going to the next to last thickener. The tanks are stepped, enabling solution to flow by gravity from one thickener to the next to No. 2 thickener or first thickener following the agitators. From here it flows to a 20 by 8-ft. Hardinge clarifier. The filtrate of the clarifier goes to the precipitation department. Excess solution overflows the clarifier into the mill sump tank, where it unites with the overflow from the primary thickener forming the mill solution.

The operation of the Dorr thickeners and agitators is too well known to require any particular comment. Each thickener is driven at 1/7 r. p. m. and agitators at 4 r. p. m. Both thickeners and agitators give very little trouble.

The Hardinge thickener being new is probably of more interest. A standard leaching tank false bottom was installed in a 28 by 10 redwood tank on which



View of mill at Katherine showing some of cyanide tanks, mill building and refinery

product. One man can easily feed 150 to 200 tons per eight hours to the crusher.

The crusher discharges onto a 14-in. belt conveyor inclined at 20 degree angle. Conveyor delivers crushed ore to a 150-ton silo type bin.

An 18-in. ratchet driven apron feeder delivers ore from center of this bin to a 6 by 6 Allis-Chalmers open, trunnion type ball mill. Feeder is regulated by throw of ratchet and by bars across the chute.

This ball mill is in closed circuit with a 4-ft 6-in. by 14-ft. 8-in. duplex Dorr classifier, the bottom of which has a slope of 3 in. to the foot. Each rake makes 18 strokes per minute. Overflow from this classifier goes to a second classifier of same size. Pulp discharges from mill at about 69 to 73 percent solids and overflows from classifier at 45 percent solids. Screen analysis of this overflow is:

was 1.76 lbs. per ton of ore, and liner consumption .35 lb.

The second classifier is in closed circuit with a second 6 by 6 open trunnion type Allis-Chalmers ball mill. Two and one-half-inch forged steel balls and manganese steel liners are used in this mill. Ball consumption per ton of ore was, in 1927, 1.73 lbs. and liner consumption .18 lb.

Average screen analysis of this classifier overflow in 1927 was:

	Percent
Plus 80 mesh.....	26
Plus 100 mesh.....	7
Plus 150 mesh.....	10
Plus 200 mesh.....	11
Minus 200 mesh.....	52

The bottom of this classifier has a slope of 2½ in. to the foot and rakes make 13 strokes per minute.

Each mill is driven by a 125 hp. slip-ring motor through Wuest gears at 24 r. p. m. and requires 85 to 90 hp.

was placed a 3-ft. bed of sand from secondary classifier. Machine operates at 1/12 r. p. m. and is set to cut 1/26 in. of sand per day. Original bed of sand is still in the tank after 18 months' operation. The thickener is fed through a center well 20 in. in diameter and 24 in. deep. About 50 tons of solution per day percolates through the filter bottom and is discharged by air lift into No. 5 thickener. The thickened pulp is pumped from center of tank by a No. 4 Dorco suction pump.

The clarifier is practically a duplicate of the Hardinge thickener, with exception that sand from the neighboring washes is used as a filter medium in place of sand from the classifier. Originally the overflow from the primary thickener flowed to the clarifier and was used as a gold solution. After a few weeks' operation the sand in the clarifier became cemented together and impervious to solution. Evidently the cementing material was CaSO_4 in the solution. Working on the theory that these sulphates would precipitate while passing through the agitators the overflow solution from No. 2 thickener was used as gold solution. The sand would eventually still become cemented as before, but it now took months whereas before it took weeks. At first sands from the secondary classifier were used as filter medium. This sand would cement easily and wash sand was substituted. The wash sand is screened through a 1/2-mesh screen and washed once to clean of organic material and colloidal matter.

A limit of about five months has been established for a bed of sand. About 1/2 in. of sand is cut per day, cuts being made whenever necessary. No fixed time could be established for the cuts nor a specified amount of cut adhered to.

A centrifugal pump pumps clarified solution from the false bottom. For the first two or three weeks after a fresh bed of sand is started this pump is not allowed to develop a vacuum in the false bottom, otherwise cloudy solution will be pulled through the sands. After a few weeks, however, the sand becomes set and a vacuum is allowed to develop. This may be as high as 12 in. of mercury. Sand and slime are discharged from center of tank bottom by a diaphragm suction pump.

Precipitation department consists of standard Crowe vacuum and Merrill zinc dust filter press equipment. A slightly larger amount by weight of silver than gold is precipitated. No lead acetate or litharge is required. Zinc dust consumption averages 0.09 lb. per ton of solution. Excellent precipitation is obtained, the press tails averaging for the year 1927, \$0.009 per ton in value. Precipitate averages 850 to 900 fine in gold and silver, and bullion produced

960-980. The purity of the press product or precipitate is due to chemical consumption of the zinc not only by cyanide but evidently by sodium and potassium hydroxides as well.

The product is fluxed and fed wet into an oil-fired D. F. C. tilting furnace. Bullion is shipped to the mint by parcel post, therefore bars are kept under 50 lbs. in weight. Flux used consists of 25 percent borax, 15 percent soda, 5 percent MnO_2 and 5 percent glass. Slag is concentrated on a wilfey table, then shipped to the smelter. Concentrates are remelted.

All machinery is electrically driven. Power is developed at the mine by direct connected Diesel engines, there being installed two 360 hp. Fairbanks Morse, one 200 hp. De La Vergne, and one 200 hp. Chicago pneumatic. Three-phase, 60-cycle current is supplied to mine and mill at 440 volts.

The following strength of solutions are maintained:

Agitators—0.50 lb. NaCN, 0.90 lb. protective alkalinity.

Head solution—0.30 lb. NaCN, 1.00 lb. protective alkalinity.

Tail solution—0.25 lb. NaCN, 0.60 lb. protective alkalinity.

This low strength of cyanide solution enables us to use barren solution as wash on the tail thickener.

Consumption of principal supplies in 1927:

Aero-cyanide—0.417 lb., or 0.208 lb. NaCN per ton of ore.

Lime—4.90 lbs. per ton of ore.

Zinc dust—0.092 lb. per ton of solution.

5-in. balls—1.78 lbs. per ton of ore.

2 1/2-in. balls—1.73 lbs. per ton of ore.

Water—0.70 ton per ton of ore.

Power—16.50 k. w. hr. per ton of ore.

Direct costs per ton of ore in 1927:

Supplies	\$0.485
Labor	0.375
Power	0.335

Total \$1.195

Total construction cost of mill and cyanide plant as it stands today was \$105,000.

The mill and cyanide plant has operated with very little grief and few shut-downs. In the year of 1927 the mills operated 97 percent of the possible running time, the cyanide plant 99 percent, and precipitation 98.5 percent. This steady operation is due mainly to two factors—steady power and efficient mill crew.

Officers and staff of the company are: Chas. Sutro, of San Francisco, president; R. L. Dimmick, of Katherine, vice president and general manager; C. R. Waters, mine superintendent; Eugene Ireland, mill superintendent; and J. H. Dundon, chief engineer of power plant.

STUDY COPPER PROBLEMS

SPECIAL attention to the metallurgical problems of the copper industry is being given by the Southwest Experiment Station of the Bureau of Mines, Tucson, Ariz., the location of this station being naturally favorable for the conducting of such studies.

The formation of magnetite in the copper converter during smelting is one of the most costly problems with which the operator is faced, as it causes loss of valuable metals in the slag and of time in operation. A study of the reaction between magnetite and ferrous sulphide is being made at the Tucson Station, as a knowledge of the products formed in this reaction and its rate under different conditions is necessary in the solution of this problem.

It has been proposed that sulphur dioxide be used in place of air in the copper converter. In this connection, the Tucson Station is studying the reaction between ferrous sulphide and sulphur dioxide. This little-understood reaction needs study in connection with devising proper equipment and processes.

The action of capillarity determines the speed at which leach liquors enter the pieces of ore, and hence is an important factor in the rate of the leaching process. Conditions for maximum efficiency are being determined at Tucson.

Equally as important as capillarity, is the effect of the diffusion rate of the enriched solution out of the ore lumps. The limitations placed on the process by this factor are being studied.

The rates of oxidation of the common sulphide minerals involved in leaching and their effect on the power of the solution to dissolve various copper minerals is being studied.

There are hundreds of millions of tons of finely divided copper concentrate tailings in the Southwest that can not be leached in place because the heaps are impermeable to the passage of solutions. Preliminary tests indicate the possibility of agglomerating such material cheaply, after which leaching methods may be applied.

To increase efficiency in the treatment of copper ores a knowledge of their mineral constituents is important. The best methods now in use for determining this are being tabulated and studied. New methods will be developed if necessary.

In a study of drilling and blasting drift rounds, the best form of drift round to be drilled, the best explosive to be used, and the best methods of loading the holes under different conditions are being determined.

MINING METHODS in the TRI-STATE DISTRICT

By D. C. MACKALLOR*

IN ORDER to form a clear conception of the mining methods in vogue in the Tri-State District and the reason for their adoption a brief description of the nature of the deposits is in point.

The ore bodies are formed in sedimentary strata of the Mississippian Series and, in general, lie in a horizontal plane varying greatly in thickness and lateral extent.

In dealing with the subject of mining in this district the writer has endeavored to adhere to mining methods that have been developed in this field and such as are usually associated with it. Primarily, these are due to the economic extraction of comparatively small-sized ore bodies and the equipment employed, especially with regard to hoisting and tramping, impresses one as being rather crude when compared to the elaborate outlay necessary for the operation of mines of a more permanent character.

The last few years has witnessed the consolidation of many individual properties and, with the longer life thus assured, such improvements as skip and cage hoists and underground power haulage have become possible. Such properties are still in the vast minority, however, and beyond passing mention, will not be considered in this article.

The average lease or fee of 40 acres has only one ore horizon, but in a considerable number two or more have existed and have been profitably exploited.

The ore bodies may be roughly divided into two types—those covering a considerable lateral extent and those which are comparatively narrow but have an appreciable length. This latter class are locally termed "runs."

PROSPECTING

Since there are no vein outcrops, prospecting in virgin territory must be all done by drilling or by shafts from the surface. In the old Joplin field, where

* General Manager of Mines, Eagle Picher Lead Co., Picher, Okla.



Shovelling and drilling a "spitter" on a high heading

Consolidations Of Small Properties Make For Efficient Installations And Operation—Wage Rate Based On Concentrates Market—Costs Segregated

deposits were shallow, this latter method was frequently used, but with their passing drilling is the only logical method for the deeper lying deposits.

Due to the broken nature of the sedimentaries, especially in the vicinity of ore bodies, core drilling has not met with favor and churn drilling is practiced exclusively. In the past a great deal of drilling was practically wasted, through unscientific methods, both in locating the holes to be drilled and in handling the cuttings obtained. Today the churn drill can be depended upon to give an accurate picture of the formations drilled through.

SHAFT SINKING

When an ore body of sufficient size has been blocked out by drilling, one or more shafts are sunk through the ore to open up the property for mining. The usual custom is to so locate the milling plant that the ore hoisted from one of the shafts can be dumped direct into the mill hopper. This then becomes known as the mill shaft. The other shafts are called

field shafts and ore from them is hoisted to the surface, dumped into a hopper and drawn off into tram cars, whence it is taken over a surface railway and inclined tramway to the mill hopper.

The usual shaft dimensions in the Tri-State field are 5 by 7 ft. in the clear.

The major portion of the mining area is overlaid with a shale blanket varying from a few feet to 200 ft. in depth, and it is necessary to crib this portion of the shaft solidly. This is done with 2 by 4 or 2 by 6 lumber and backed solidly with scrap lumber or cordwood. Beyond this, no timbering is required, except where additional shale pockets or very loose bouldery ground is encountered.

Shaft sinking is usually contracted for at from \$8 to \$9 per foot through the shale and \$12 to \$15 through the solid rock. The operator furnishes air and equipment but not explosives.

The shaft round in common practice is shown in Figure 1, jackhammers being used exclusively for drilling, except in going through the shale and soil overburden, which is mostly pick and shovel work. Such a round, as shown, will break to a depth of 4½ ft., the usual practice being to drill on one shift and muck on the next. Forty percent of gelatin powder is the usual explosive used.

DRIFTING

When two shafts have been sunk through an ore body, they are connected at the bottom by a drift. Drifting is usually used to open up more remote ore bodies, indicated by drilling, for haulage ways and general exploratory work. The standard drift is 6 by 7 ft. in the clear and is contracted for at prices ranging from \$6 to \$8 per linear foot, depending on the kind of ground to be penetrated, prevailing wages, etc. As in the case of shaft sinking, the contractor furnished explosives but is supplied operating equipment. A drifting round commonly employed is shown in Figure 2. Such a round will break from 4 to 6 ft., depending on the character of the rock.

Thirty-five percent gelatin powder is the usual explosive.

HOISTING

For shaft-sinking purposes a temporary wooden frame known as a sinking derrick is employed. The hoist, using steam or air as motive power, is mounted about 14 ft. above the collar of the shaft and a wooden tramway leads out from this three or four bents to permit the dumping of material excavated. These bents are added to as necessity demands.

A steel can 30 in. in diameter by 30 in.



in depth, with a capacity of about 1,000 lbs. is used for hoisting muck. When this reaches the level of the hoist, it is placed on a flat-topped car and trammed to the dump.

On the completion of shaft sinking and the connecting drifts, the temporary headframe is torn down and a permanent one erected in its place. The majority of these are of wooden construction, but steel is constantly gaining in favor.

Formerly steam was the principal motive power used for hoisting, but today such an installation is rare, steam having been supplanted by electric motors of from 75 to 125 hp. capacity. These are slip-ring motors with reversible control.

In isolated instances, on some of the larger properties in the field, self-dumping skips or cages are used to hoist the ore (locally called dirt) from the ground, but in the vast majority of cases steel buckets (locally called cans) of from 1,250 to 1,750 lbs. capacity are used without crossheads or guides.

At first sight, this seems to the uninitiated a very crude method of hoisting, but it is a method which had been developed in the Joplin district, when the small size of the ore bodies would not permit of a more expensive installation, and has reached such a high degree of

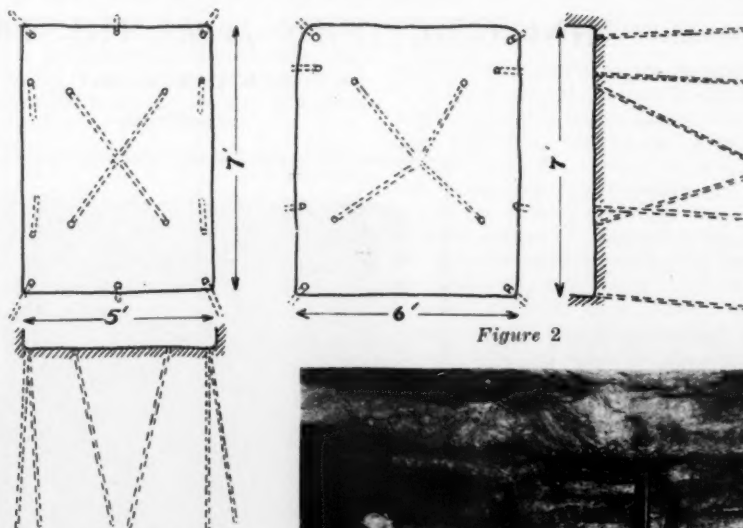


Figure 1

Left—Typical pillar. Considerable skill is shown in leaving these nearly cylindrical in form. Below—Hoisting arrangement at bottom of shaft, showing "hooker" steadying can. Right—Drilling from a 9-ft. post. Shovelling from a muck pile



efficiency that, only on an ore body of known considerable life, would any other method be considered.

At the end of the cable is a snap hook, which a man working at the bottom of the shaft and known as a hooker attaches to the bales of the loaded buckets as fast as they are pushed into the shaft. The coordination of this hooker and the hoistman alone is a joy to all lovers of good team work, the remarkable thing about it being that no hoisting signals of

any kind are used in hoisting ore.

The hooker hooks on a loaded bucket and instantly the hoistman, knowing partly by feeling of the cable and partly by instinct when this has been accomplished, picks up the weight; the hooker steadies it a fraction of a second and it is whisked from sight.

On arrival at the surface, the hoistman shuts off his power and the can shoots up into the headframe, whence the hoistman stops it with a foot brake and, with practically one continuous motion, attaches a tail chain to the bottom of the bucket, lowers it a few feet to dump, raises it, detaches the tail chain and releases the brake, allowing the bucket to drop to the bottom of the shaft. Here it is detached by the hooker and another one hooked on in its place to repeat the cycle. All this takes place in less time than it takes to tell about it, which may be realized by the fact that 800 buckets hoisted from a depth of 270 ft. in 7½ hours, is of common occurrence, and this number has often been exceeded by a considerable margin.

STOPING

The method of mining may be generally classed under the room and pillar system, but this must not be confused with the room and pillar system used

in coal mining. In general, the ore bodies are stope out over whatever lateral extent they occur, commencing at the shaft and enlarging this opening until barren material or ore too low grade to be mined is encountered. Pillars are left at more or less regular intervals and of a size and spacing dependent on the character of roof overlying the ore body. For example, an ore body having a height or thickness of 30 ft. or more with a good firm roof would have pillars of about 30 ft. in diameter and spaced 50 ft. apart.

Ore bodies having a height or thickness up to 10 ft. may be drilled from a post on a single set up, the roof holes being drilled first and the machine gradually slid down to drill the remainder of the round.

In the majority of cases, however, the ore bodies are of greater thickness and a heading of about 7 ft. in height is first driven next to the roof until it has been advanced about 30 ft. Long holes, called stope holes, are then drilled at the base of the ore formation to a depth of 18 to 22 ft., looking slightly downward. These holes are then sprung, ore chambered at their end by successive small charges of dynamite until an opening large enough to accommodate a hundred or more pounds of dynamite has been formed. The charge is then detonated. If properly placed, two such charges are often sufficient to tear out the entire slab of ore under the heading between two pillars, leaving only enough of a shelf for the heading machine to be set up again.

In very thick ore bodies it becomes necessary to lighten the burden of the stope hole by one or more holes placed above it and drilled and charged in a similar manner. Such holes are called splitters. Ore bodies as thick as 25 or 30 ft. can be mined with one series of stope holes after the heading has been cut.

Heading rounds are usually drilled from 8 to 10 ft. deep and care is taken to place the successive rounds as to leave a good square break for the succeeding round. The difference between good and poor machine men can be instantly noted by observing the condition of the various headings after a round has been shot.

Up until the past year the use of stemming has been conspicuous by its absence, due mainly to indifference on the part of men handling explosives. An increasing spirit of cooperation has largely overcome this, and very satisfactory results have been obtained through its use by several of the larger companies. An estimated saving of 15 percent has been recorded in several instances.

MUCKING

Mechanical shovels of various types have been tried in many of the mines of the district, but in almost every instance they have been discarded in favor of hand shoveling. The reason for this may lie partly in an unfavorable attitude of the men toward their use, but, even where this was apparently overcome, the cost per ton seldom equaled that obtained by hand work.

The Tri-State shoveler, using a No. 2 scoop, is a pretty efficient machine himself, and a good shoveler has no difficulty in loading 25 to 30 tons of ore per day under favorable conditions.

Like all Tri-State wages, the amount received by the man is based upon the concentrates market. Present-day conditions show a shoveling cost of approximately 17 cents per rock ton. Occasionally men are found who will shovel 50 to 60 tons of ore per day. They are usually known as hundred-can men; that is, they will load 100 cans holding .6 of a ton of ore day in and day out, but they seldom last long at this pace.

TRAMMING

Except in a few of the larger properties, where ore bodies have been extended a very considerable distance away from the shaft, mule haulage is depended upon almost entirely in bringing the ore from the working faces to the shaft.

Cans are mounted on small, flat-topped, four-wheeled trucks called ground cars, fitted with couplings so that they may be hauled in trains, usually of six or more. Roller bearings are rapidly replacing old types, making for easier hauling.

Tracks of 12 or 13-in. gauge, using 12-lb. rails, which were formerly found everywhere, are becoming obsolete. Wider gauges and heavier rails are now the rule.

COSTS

Any article on mining methods would be incomplete without a word in regard to costs. Actual mining costs, carrying their proportionate share of overhead expense but without depletion, range in general from \$1 to \$1.50 per rock ton and may be classified as follows:

	Percent
Drilling	22
Explosives	13
Shoveling	16
Tramming	7
Hoisting	11
Pumping	6
Power and miscellaneous.....	25

Labor forms somewhat less than 50 percent of these items and it may be classified thus:

	Percent
Drilling	24
Shoveling	43
Hoisting	8
Miscellaneous	25

The percentage under miscellaneous may seem high. This includes such items as compressor and pumping labor, track men, roof men, repair men, shift bosses and screen (grizzly) labor. This last item properly belongs under milling, but it is the custom of the district to carry it thus.

CONCLUSION

In concluding the writer wishes to reiterate that he has endeavored to present a picture of Tri-State mining in its usually accepted sense. Many improvements and innovations, of which the authors are justly proud, have been introduced in various individual mines, and if he has failed to make mention of these apologies are duly offered. The system in general is efficient and as such will continue in existence until the camp ceases to be.

PREVENTING ACCIDENTS FROM EXPLOSIVES IN METAL MINES

PREMATURE explosions may result from improper methods of opening boxes of explosives, warns the United States Bureau of Mines. They should be opened with wooden tools, such as wooden wedges and wooden mallets.

Assuming that fresh explosives and high-grade blasting supplies are employed in a metal mine, accidents during charging and from premature explosion can be prevented by care in charging by a standard method. The use of "shot" or primer tubes makes it possible to place the "shot" or primer in safety, for they not only prevent the "shot" from falling into crevices and chambers or getting crosswise of the hole but hold the detonators in place in the cartridge. At a given mine a standard "shot" or primer should be adopted and used in all "drift," stope and "splitter" holes. In mines free from ragged holes "shot tubes" need not be used. In any event, the fuse should be so secured that the detonator is anchored in place preferable in the center line of the cartridge. The "shot" and the cartridges immediately following it should be placed in the hole carefully. Other cartridges should be pressed home firmly but never forcibly. The spiked end of the tamping bar should be used only for leading in the cartridges and the "shot;" tamping should be done only with the wooden end of the tamping bar. Explosives should be protected from sparks and flames; thus, fires, open lights or smoking should not be permitted near explosives. Preferably the holes should be charged just before firing time. Stemming should be used. From the time the charging of holes is begun until they are fired all other work near the holes should cease, says the Bureau.

PRACTICAL OPERATING MEN'S DEPARTMENT



COAL

NEWELL G. ALFORD

Editor

*Practical Operating Problems
of the Coal Mining Industry*



COAL PREPARING PLANT of the MIDDLEFORK MINE, UNITED STATES FUEL COMPANY

By A. F. ALLARD*

THE construction of a modern coal preparing plant by the United States Fuel Company for the purpose of reducing both the sulphur and ash in the coal, to make a satisfactory coking product for metallurgical purposes, was the outcome of careful investigations and research work covering a number of years. The most important and largest capacity coal washing plants, both in this country and Europe, were visited, with a view of obtaining the most up-to-date data and information pertaining to the design for the construction and mechanical installation of a modern coal preparing plant, to wash 4,000 tons of coal per day.

The coal preparing plant of the United States Fuel Company is situated at the Middlefork Mine in Franklin County, Ill., and is one of the most modern and largest capacity coal washing plants in this country. Many special features have been embodied in the general design of the plant layout, including the conveying system, crushers and screening apparatus for sizing the raw coal, storage, washing, sludge recovery and disposal systems, and the drying of the finished product ready for shipment.

The construction work was started during August, 1917, and the plant was placed in operation on October 24, 1918.

The raw product is supplied from the Middlefork mine, where the coal lies at a depth of 620 ft. and the vein has an average thickness of 7 ft. Fig. 1 (page 252) shows plan layout of the washery

The Plant Of This Company Was Designed To Reduce Both Sulphur And Ash In The Coal To Make A Satisfactory Coking Product For Metallurgical Purposes—This Description Fully Covers All Features Of The Plant, Including Conveying System, Crushers, Coal Screening Apparatus, Jigs, Driers, Thickeners, Sludge Recovery And Pumping Systems, Refuse Disposal, Washery Plant, And Electric Power Requirements

plant buildings and conveying system.

CONVEYING SYSTEM

Starting at the mine hoisting shaft the several conveyors answer the following purposes:

Conveyor "A," Inspection Table (86 in. x 40 ft., capacity 600 tons per hour), conveys the run-of-mine coal immediately after leaving the weigh pan into a large hopper at the end of the table, where the coal is divided, half of the total capacity passing through separate chutes onto each of conveyors "B-1" and "B-2." This table is also used for docking purposes, and when this is necessary the coal from the hopper at end of table is by-passed and loaded into railroad cars placed under the tipple, from which point they are dropped by gravity to the foreign coal unloading hoppers, where they are unloaded and conveyed to the crusher house by an independent conveyor.

From the inspection table the coal is handled on conveyors "B-1" and "B-2" (each 42 in. x 60 ft., capacity 300 tons each per hour). These two conveyors deliver the coal to the crushers.

Conveyor "C" (42 in. x 225 ft., capacity 250 tons per hour), delivers the foreign coal direct to the crushers; the coal carried on this conveyor is delivered

from the railroad track hoppers by conveyor "C-1" (42 in. x 44½ ft., capacity 250 tons per hour).

The coal, after passing through the two sets of crushers, ¾-in. and under in size is conveyed to the raw coal storage bin by conveyor "D" (42 in. x 348 ft., capacity 600 tons per

hour); this conveyor is provided with a tripper for distribution of the coal into bin.

From the storage bin the crushed coal is delivered through 22 undercut gates into a traveling hopper car operating on a track and fed to conveyor "E" (30 in. x 202 ft., capacity 250 tons per hour). This conveyor runs level and is supported from the concrete floor underneath the storage bin and is provided with a tripper.

Conveyor "E" delivers the crushed coal to incline conveyor "F" (30 in. x 118 ft., capacity 250 tons per hour), which leads to the screening house, and where the coal is screened and sized.

From the screening station the coal is delivered in three sizes into the steel storage tanks located above the jig floor of the main washery building.

The screened coal is handled by conveyor "G" (30 in. x 402 ft., capacity 200 tons per hour), which delivers the middle size coal; conveyor "H" (24 in. x 402 ft., capacity 50 tons per hour), which delivers the fine size, and conveyor "J" (24 in. x 252 ft., capacity 100 tons per hour), which delivers the large size. Trippers are provided on each of these conveyors for distributing the coal to several compartments of the bin in the sizes required for the several jigs.

* Chief Engineer, United States Fuel Co., Franklin County, Ill.



Fig. 2. View of completed buildings showing foreign coal unloading station and conveyor system for delivering the foreign coal to the crusher house

The finished product of washed coal, after being dried, is conveyed from the dryer house to the loading station on conveyor "L" (30 in. x 193 ft., capacity 250 tons per hour), where the coal is by-passed from hoppers into chutes for the loading of the railroad cars on two separate tracks.

The tabulation below gives the data for the entire conveying system.

CRUSHERS

The coal is all crushed by roll crushers. Four sets of 36-in. x 36-in. crusher rolls are used; the two upper sets are grizzly rolls breaking the run-of-mine coal to 4 in. and under, and the two lower sets for finishing from 4 in. to $\frac{3}{4}$ in. and under, at a capacity of 300 tons each per hour. Each set of the finishing rolls is made up of manganese teeth segments; 15-in. face; cast-iron sole plates and steel housing; 5 $\frac{7}{8}$ in. x 14 in., C. I. rigid babbitted and spring box adjustable pedestals and out-board bearing.

Each set of crushers occupies a floor space of 110 sq. ft. Twenty horsepower is required for each set and the rolls are geared for a speed of 800 ft. per minute. The flow of the coal through each set of crushers is as follows:

The mine run coal after leaving con-

veyor "B-1" and "B-2," or "C" from the foreign coal hoppers, is passed over a $\frac{3}{4}$ -in. bar screen placed in the upper chute. The screen is 4 ft. 2 in. wide by 6 ft. 6 in. long. They are placed on a 38-degree incline and by-pass the fine coal, $\frac{3}{4}$ -in. in size and under, around and below both the upper and lower sets of crushers to conveyor "D," which leads to the raw coal storage bin.

Below the top set of 36-in. grizzly rolls and above the finishing rolls, there is placed a nest containing eight special $9\frac{1}{2}$ -in. diameter grizzlies mounted on a heavy C. I. frame. These grizzlies again by-pass all of the coal $\frac{3}{4}$ -in. in size and under around the finishing rolls and the fines are led through a chute to conveyor "D," the $\frac{3}{4}$ -in. coal and over going through the finishing rolls. These grizzlies are driven from the crusher shaft by means of chain and sprocket wheels.

Each set of crushers is belt driven by a 250 h. p., 1,165 r. p. m. motor.

For protection against tramp iron, such as brake shoes, coupling pins, bolts, machine bits, etc., found in the coal coming from the mine and injuring the crusher rolls, there is provided at the head of conveyors "B-1," "B-2" and "C," magnetic separators. The mag-

netic head pulleys are each 36 in. x 44 in. The coils are protected with heavy bronze rings, and the end plates of the pulleys are also of heavy bronze. Dust-proof housing, switch panel with switch, and pilot lamp are also provided. The operating principle of these machines is very simple. The coal fed on the conveyor belts is passed over a magnetized pulley. The nonmagnetic material falls by gravity into the chutes leading to the crushers, while the iron and magnetic materials are attracted and held firmly against the belt until it is carried to the point where the belt leaves the pulley on the underside and is there discharged back of a partition.

COAL SCREENING APPARATUS

The original coal screening apparatus consisted of two duplex shaking screens, together with their rotary feeders, required to screen the coal which has been already crushed to $\frac{3}{4}$ in. and under, into the following sizes:

First— $\frac{3}{4}$ -in. to 3/8-in., 3/8-in. to 3/16-in., and 3/16-in. to dust.

Second—Also, $\frac{3}{4}$ -in. to 3/16-in., and 3/16-in. to dust.

Third—Also, $\frac{3}{4}$ -in. to 3/8-in., and 3/8-in. to dust.

The two duplex screens and feeders are identical; therefore, one only will be described.

In the chute which feeds the screen, there is located a rotary pocket feeder which distributes the coal across the width of the screen and regulates the feed to same. This feeder is driven by a belt and gear reduction from the eccentric shaft of the screen. The screen frame consists of rigidly braced structural steel frames, suspended by laminated ash strips from a beam of the screen house. Each of these frames is driven by eccentrics and connecting rods, the eccentrics being so placed as to put the screens in balance. A 500-lb. flywheel is provided on the eccentric shaft. The eccentrics have wide faces and are bronzed bushed and carefully fitted and provided with arrangement to

LIST OF CONVEYORS

Unit	Width	Length	Lift	Capacity Tons Per Hour	Speed Feet Per Min.	H. P. of Motor	Speed of Motor R. P. M.
Conveyor "A"	66"	40' 0-5/8"	2' 0"	600	51	30	865
" "B-1"	42"	60' 3-7/8"	19' 10-3/16"	300	200	25	575
" "B-2"	42"	60' 3-7/8"	19' 10-3/16"	300	200	25	675
" "C"	42"	225' 3-1/8"	61' 2-5/8"	250	206	50	870
" "C-1"	42"	44' 5"	13' 10"	250	196	30	900
" "D"	42"	348' 4-7/8"	50' 9-13/16"	600	480	150	695
" "E"	30"	201' 11"	Level	250	350	15	865
" "F"	30"	117' 11-9/16"	38' 0"	250	360	25	600
" "G"	30"	401' 5"	47' 0"	200	350	50	870
" "H"	24"	401' 5"	47' 0"	50	250	25	865
" "J"	24"	251' 5"	47' 0"	100	250	25	865
" "L"	30"	192' 10-7/8"	25' 3"	250	350	30	865

take up wear. The rod ends connecting to the shafts on the screens are similarly provided with method of taking up wear. The screen plates, which are 6 ft. wide and 9 ft. long, are attached to an auxiliary frame suspended within the main frame by laminated ash strips.

The connection between the screen frame and the main frame is made by means of a cast-steel jaw on each side of the main frame, engaging a cast-steel lug on each side of the screen frame, thus imparting to the screen frame a jarring motion which may be regulated by fiber fillers to suit the conditions. This slight jarring motion prevents the clogging of the fine mesh and increases the capacity of the screen very greatly.

The upper plate has 7/16-in. holes and the lower plate 1/4-in. holes. The lower section of screen has but one deck, the perforations being 7/16 in. By means of the flop gates, it is possible to make the following combinations:

First—3/4-in. to 3/8-in. to conveyor "J"; 3/8-in. to 3/16-in. to conveyor "G"; 3/16-in. to dust to conveyor "H."

Second—3/4-in. to 3/16-in. to conveyor "G"; 3/16-in. to dust to conveyor "H."

Third—3/4-in. to 3/8-in. to conveyor "J"; 3/8-in. to dust to conveyor "G."

Both the No. 1 and No. 2 screens are each driven with a 30 h. p., 865 r. p. m. motor, and the screen feeders with 7 1/2 h. p., 900 r. p. m. motors. Two double-deck electric vibrating screens were added to the screening equipment in 1923.

JIGS

Eighteen horizontal plunger jigs are installed in reinforced concrete jig tanks. This number of jigs were placed to guarantee the full capacity of output; namely, 4,000 tons per a 16-hour day.

The above type of jig is further improved by cross-heads and quarter box bearings in connection with the plunger shaft, which eliminates wear and reduces the amount of horsepower necessary for the operation of the jigs.

The main drive shaft for the jigs runs at 178 r. p. m., and the jig eccentric shaft at 83 r. p. m., the latter operating the plungers in the jig tanks.

Two 100 h. p., 870 r. p. m. motors drive the jigs, each motor taking care of nine jigs. A flexible coupling is provided between each motor and the fast turbo gears.

The feed of the raw coal onto the jigs from the steel storage bins is regulated by a ratchet feeder driven from the main drive shaft. Provision is made for wetting the coal in the feed box before it reaches the jigs. Wooden plungers, 4 ft. x 6 ft., constructed at the plant are installed in the jig tanks. They are made up of 2-in. x 6-in. T. and G. yellow pine boards built up in thickness of three



Fig. 3. View showing reinforced concrete jig tanks and steel storage bins above the jig floor, during the course of construction.

layers well spiked and bolted together with 1/2-in. bolts, provided with heavy washers on each side of the plungers. The two pistons driving each plunger are 2 in. in diameter, and they are placed 3 ft. 6 in. apart. The screen plates, perforated with the various size openings, are fastened to C. I. supports in the jig tanks with cap screws. Feldspar beds are provided for the jigs and the washed coal is sluiced in concrete launders leading to the washed coal settling tank and the dewatering elevators. The refuse is carried by dewatering elevators to the main concrete flume which carries it to the refuse settling tank and elevators. Three concentrating tables of various types were added to the original installation for conducting experiments in washing the fine coal, these later on became a part of the regular operation.

DRIERS

Four centrifugal drying machines of the latest type are used for drying the coal. Each machine has a capacity of 75 tons of dried coal per hour. By dried coal is meant the product as it is delivered from the machines. Each machine operates at a speed of approximately 400 r. p. m. and is fed with coal coming from dewatering elevator pits by way of dewatering elevators.

These machines dry the coal to approximately 7 percent free moisture or under; the term "free moisture" refers to moisture that has been added and is over and above the inherent moisture contained in the coal as it lies in the mine.

One belt-driven 50-h. p. motor, running at 860 r. p. m., furnishes the power for driving each of the machines; not

that the machines require this amount of power, but the motor installed will provide ample power for any extra starting load that may occur.

Each machine weighs approximately 19,000 pounds.

For controlling the feed of coal to the driers there is provided spur gear speed reducers, direct connected to 7 1/2 h. p., 900 r. p. m. motors.

THICKENERS

For settling and collecting the fine coal in the form of sludge, there are installed four extra heavy continuous thickeners.

These thickeners operate in reinforced concrete tanks each 70 ft. diameter by 12 ft. in depth, and each weighs approximately 12,000 lbs.

For collecting the refuse tailings there is installed a smaller thickener operating in a reinforced concrete tank, 50 ft. diameter by 10 ft. in depth, weighing approximately 8,750 lbs.

The diaphragm pumps used for the pumping of the sludge in connection with the above thickeners are described in another paragraph.

Following is a brief description of the thickener machines:

The mechanism consists of a vertical shaft held in position at the top and bottom. The top and entire mechanism is supported by a steel riveted truss which spans the full width of the tank and is anchored into the concrete side walls. At the bottom the shaft terminates in a spider casting, which in turn supports the two horizontal long and short arms; both types of arms are placed opposite each other. Attached to each long arm are seven steel scraper blades, and on each short arm three

Fig. 7. Completed plant, showing buildings and conveyor system from main hoisting shaft to loading station of the finished product.



blades, spaced at equal distances apart.

Suspension rods are provided to relieve the spider casting from any undue strain at the point of connection. A hand lever operated lifting device is provided at the top of each machine which operates by a worm gear and pulley, permitting the raising or lowering of the working arms in the sludge. A set of radial scraper blades are also attached at the bottom for the center scraper.

Each thickener is operated by a 7½ h. p., 865 r. p. m. motor supported on a platform floor on the truss. A chain and sprocket drive rotates the thickener which is geared to run at a very slow speed.

SLUDGE RECOVERY AND PUMPING SYSTEMS

For handling the sludge from each thickener there is provided a No. 4 Simplex self-contained diaphragm pump. These four pumps are installed in the drier house; they are belt driven by a 10 h. p., 865 r. p. m. motor. These pumps handle all of the sludge from the four 70-ft. thickeners and can be used to deposit the sludge into a reinforced concrete sludge cistern, 13 ft. x 21½ ft. x 9½ ft. deep, having a capacity of 19,800 gallons, or by a system of chutes the sludge can be delivered direct from the pumps to either the washed coal loading conveyor "L" or to the washed coal elevator buckets for direct delivery into the driers. The sludge deposited in the cistern and obtained either from the thickeners or from the driers is handled by a 5-in. centrifugal pump, direct connected to a 50 h. p., 1,170 r. p. m. motor. This pump delivers the sludge on top of the washed coal elevator buckets. Sludge from the driers can be run either to the sludge cistern in the drier house or to the 30 ft. x 30 ft. x 10 ft. deep settling basin, having a capacity of 75,000 gallons. The clear water from this basin is handled by a 2-in. centrifugal belt-driven pump which delivers the water into the flume containing the overflow water from the thickeners. The sludge from this basin is handled by a 4-in. centrifugal pump, belt-driven by a 10 h. p., 1,165 r. p. m. motor, and provision is made for deliver-

ing this sludge into the sludge cistern where it can be pumped back to the hoppers above the driers. The sludge obtained from the 50-ft. refuse thickener is handled by a diaphragm pump into a small cistern in the pump house and thrown on the refuse pile by a 2-in. centrifugal pump, belt driven by a 7½ h. p., 865 r. p. m. motor.

A system of reinforced concrete galleries are constructed beneath the surface of the ground, which contain the sludge pipes leading to each of the thickeners. The branch galleries for two thickeners containing one 4-in. line are 2 ft. 6 in. x 4 ft. 6 in. high with side walls, top and bottom 5 in. thick. These branches lead into the main gallery. The portion containing two lines of 4-in. pipes is 3 ft. x 4½ ft. high with side walls, top and bottom 5 in. thick and the gallery leading direct to the sludge well containing four lines of 4-in. pipe is 5 ft. x 4½ ft. high with side walls, top and bottom 7 in. thick. These four lines lead into the sludge pumping well located in the drier house; the well is constructed of reinforced concrete and is 8 ft. 6 in. x 12 ft. 4½ in. high and is provided with a man-hole and ladder-way.

Cast-iron inserts and discharge cones are placed at the bottom of each thickener, leading the sludge into the 4-in. lines. Gate valves are placed on both the vertical and horizontal pipes so that in case of emergency the flow of sludge can be quickly shut off. For cleanout purposes a 4-in. cross is provided be-

tween the vertical and horizontal pipes having a 4-in. screw plug on one branch, and on the other a connection to the 1-in. fresh water line.

The galleries are all accessible and each is provided with large size man-holes and ladder-ways.

The main system water is returned from the 18 jig tanks and thickeners through a 30-in. cemented tile drain to the 16 ft. x 30 ft. x 15½ ft. deep cistern at the pump house. This cistern has a capacity of 54,800 gallons and additional storage is obtained by having this cistern connected by an 18-in. tile line to the 60 ft. x 60 ft. x 10 ft. deep reinforced concrete clearing basin, having a capacity of 300,000 gallons, and which is also used for storage of the system water.

Provision is made for handling the sludge accumulating in the 60-ft. x 60-ft. basin by a 4-in. centrifugal pump, belt driven by a 10 h. p., 1200 r. p. m. motor. This pump also delivers the sludge obtained from the refuse settling tank through a 4-in. line into the 50-ft. refuse thickener. All of the return system water is handled into the 75,000 gallon capacity water tower by two 10-in. "Worthington" horizontal split casing volute open impeller pumps, each having a capacity of 3,500 g. p. m. against a total head of 83 ft. at a piston speed of 1,200 ft. per minute. The shafts are extended with flexible couplings and each pump is direct connected to a 125 h. p., 1,160 r. p. m. motor. All parts coming

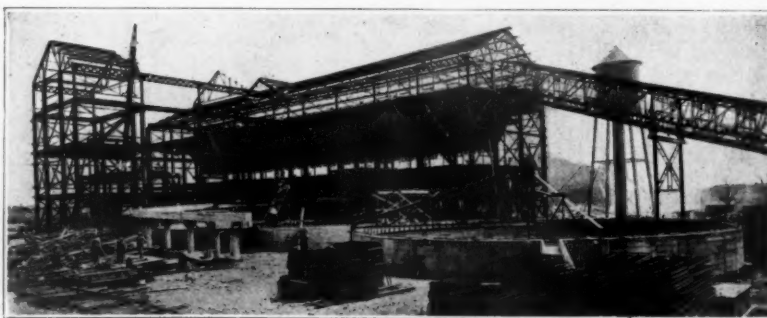


Fig. 4. Construction view showing, in the foreground, two 70 ft. diameter concrete Dorr Thickeners in connection with the Sludge Recovery System. In the background, left to right, Drier Building, Main Washery Building and 75,000-gal. Water Tower



in contact with the liquid are constructed with acid-resisting bronze.

REFUSE DISPOSAL

The refuse obtained from the jig tanks is conveyed with dewatering bucket elevators to a concrete flume which delivers all of the refuse into the reinforced concrete settling tank (size 13 ft. x 13 ft. at top, 8 ft. x 8 ft. at bottom, depth 9 ft., capacity 6,750 gallons), where it is elevated by bucket elevator into the steel refuse bin (capacity 75 tons). From the bin the refuse is handled by gravity into a 5-ton capacity dump car equipped with side doors. The refuse is hoisted up the 42-in. gauge track on a 30° incline with a 60 h. p. electric hoist. The car at the top of the incline engages a trip, which automatically releases the side doors and dumps the material; the car then returns by gravity to the refuse bin, running through a device which again automatically closes the side doors of the car. One man takes care of the entire operation of loading and hoisting the car.

WATER SUPPLY

The water supply for coal washing purposes and for use at the Middlefork Mine is obtained from a reservoir located on Drummond Creek two miles north of the washery plant. The tributary to this reservoir has an area of 2,500 acres. The stream mentioned is very small and no water runs during the dry seasons, so that the supply is entirely dependent upon the annual rainfall in this locality, which made it very necessary to secure a reservoir of large capacity, so that an adequate supply of water is guaranteed

during all dry seasons. The flooded area covers 200 acres, and there is at present impounded 500 million gallons, which supply may be further increased to 800 million gallons if found necessary at any future time.

The embankment of the dam is 1,800 ft. long and has a height of 35 ft. above the Drummond Creek basin. Water for the plant is pumped by two 8½-in. x 8-in. single acting triplex pumps, each having a capacity of 300 g. p. m., direct connected to 25 h. p., 850 r. p. m. motors. These pumps are installed in a brick and concrete pump house at the reservoir site. The water is pumped through an 8-in. C. I. line leading direct to the 75,000 gallon steel water tower at the washery plant. The water is delivered to the jig tanks under a 40-lb. pressure through 20-in. and 12-in. C. I. lines.

WASHERY PLANT BUILDINGS

The washery plant and structures consist of the following:

Steel structure for the Inspection Table in the tippie at main hoisting shaft. Crusher house, size 30 ft. x 40 ft. This building has five floors and a total floor space of 5,430 sq. ft. Steel structure and inspection platform at the foreign coal unloading hoppers. Reinforced concrete raw coal storage bin, 34 ft. x 201 ft. x 50 ft. high, having a capacity to store 4,000 tons. The supporting structure for the roof on this building is of steel. Screen house, 24 x 41 ft. This building has four floors and a total floor space of 3,600 sq. ft. Main washery building and jig house, 48 ft. x 220 ft., with drier house extension, 40 ft. x 80 ft. The main washery building has

three floors and a total floor space of 31,680 sq. ft. The drier house has three floors and a total floor space of 9,600 sq. ft. Pump house, 25 ft. x 33 ft., and steel structure at the loading station for the finished product. All of the buildings and structures are of fire-proof construction, erected on concrete foundations. The steel work of the smaller buildings and roofs of the conveyor housing is all protected and covered with No. 18 and 20 gauge "Keystone" copper bearing corrugated steel, the heavier material being placed on the roofs. The roofs of the main washery building, raw coal storage bin, shed over foreign coal hoppers and loading station are covered with 12-in. x 12-in. asbestos cement shingles, laid diamond shape on asbestos felt.

Steel sash, ventilating type of windows are used throughout all of the buildings.

The floors in all of the buildings are constructed of reinforced concrete. All of the conveyors are provided on both sides with reinforced concrete slab walkways.

The steel storage bin erected in the main washery building for supplying the different sizes of coal to the jigs has a total capacity of 2,000 tons. Bulkheads are provided in this bin for the several sizes of crushed and screened coal.

All of the structural steel work included in the buildings, conveyor and machinery supports for the entire job was fabricated and erected by the Illinois Steel Co.

The quantities of materials used in the construction of the washery plant buildings include 1,755 tons of structural



Fig. 5. View of completed buildings, showing raw coal storage bin, screen house, main washery building and refuse disposal dump

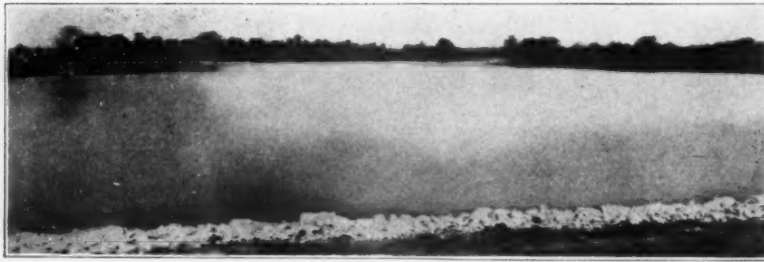


Fig. 6. View showing reservoir from the breast of dam

steel, exclusive of steel used for the reinforced concrete. Of this amount, 776 tons were used in the construction of the main washery building.

9,000 cubic yards of plain and reinforced concrete.

11,500 barrels of "Universal" Portland cement.

8,520 tons of crushed stone.

5,765 tons of washed sand.

610 sets of steel sash ventilating frames, containing 8,000 lights of glass.

464 squares of cement shingle roofing.

1,089 squares of corrugated steel covering and roofing for the buildings and conveyors.

2,343 linear feet of belt conveyors.

LABORATORY

A brick building is provided for the laboratory, in which the usual equipment is installed for conducting tests and analyzing the different coal samples.

Daily sink and float tests are made to determine the percentage of sulphur and ash, etc., both in the crushed raw coal and washed coal. Analyses are also made of the washed coal sludge from the Dorr thickeners and driers. Tests and analyses are also conducted of the washed coal product and refuse obtained from the concentrating tables.

The samples taken daily from the belts, etc., are prepared for analysis in the sample room located in the main washery building.

An expert chemist is in daily charge of the work pertaining to the taking of the various coal samples; also for conducting the necessary tests and making analyses of the coal samples.

ELECTRIC POWER AND EQUIPMENT

Electric power for operating both the mine and the washery plant is obtained from the power station of the Central Illinois Public Service Co., located at Muddy, Ill. The power is transmitted over 32 miles of 33,000 volt transmission line erected on steel poles with 60,000 volt insulators. This line terminates at the outdoor transformer sub-station at the Middlefork Mine. The current is here reduced to 2,200 volts through three 1,000 K. W. transformers. From the

transformers the power is taken underground to the inside of the mine hoisting room, where it is distributed through a main switchboard consisting of 16 panels. One of these panels records the total incoming current for the entire plant. This panel connected by oil break switches by remote control is distributed as follows: One panel controls the 600 h. p., 2,200-volt slip ring induction motor, driving the 800 K. W., 450-volt d. c. fly wheel generator for the main hoist. A liquid type slip regulator is provided for the control of this motor.

One panel controlling the auxiliary 200 h. p. hoist motor is controlled through a contactor starter placed near this motor.

One panel controlling the mining machine circuit at 2,200 volts laid underground to the bottom of the ventilating shaft, branching from this point to six transformer stations located in different parts of the mine and operating the 220-volt a. c. mining machines.

One panel controlling the 150 h. p., 2 speed, slip-ring induction motor driving the ventilating fan through an automatic self-starter located in the fan house.

One panel controlling one set of transformers for lighting service and shop motor on the mine side.

One panel controlling the air compressor equipped with 2,200-volt motor and automatic starter.

One panel controlling the main feeder circuit leading to the sub-station controlling the motors for the washery plant.

One panel controlling one 300 K. W., 720 r. p. m. synchronous motor generator set.

One panel controlling the exciter on this set.

One generator panel controlling the 250 d. c. voltage for the above set.

Two d. c. feeder panels controlling the d. c. feeders leading to the shaft bottom.

One main hoist d. c. panel controlling the 1,150 h. p., 100 r. p. m., 450-volt motor for the main hoist.

One panel controlling the exciter for the main hoist fly wheel generator.

One blank panel for future extensions.

The sub-station for the washery plant consists of a 9-panel switchboard, three 300 K. W., 2,200 to 440-volt transformers. The 2,200 voltage is distributed from this sub-station and used for operating the two 250 h. p. squirrel cage induction motors driving the crushers, also two 125 h. p. squirrel cage induction motors for driving the two 10-in. centrifugal pumps, one 50 h. p. squirrel cage induction motor driving the 5-in. sludge pumps, and the two 25 h. p. motors driving the reservoir fresh water pumps through one set of transformers at 220 volts. The balance of the washery motors are driven on the 440-volt current.

A very noticeable feature of this plant is the elimination of all poles and overhead wiring around the entire plant, all of the interior circuits being enclosed in metal conduit and all exterior circuits between buildings laid with lead cable, encased in fibre ducts beneath surface of ground.

A system of air pipe lines is installed leading from the air compressor to each motor, making air available for blowing and cleaning the dust out of the several motors.

HEATING SYSTEM

Steam for heating all of the washery and mine buildings is furnished by two 150 h. p. return tubular boilers installed in a brick boiler house centrally located between the crusher house and the main washery building.

TRACK LAYOUT

The railroad track system consists of five running tracks of 85-lb. rail. All of the tracks are laid on a 1½ percent grade permitting cars to be dropped from the empty yard to the washed coal-loading station; also to the loaded car storage yard. Both the empty and loaded storage yards have a capacity to hold 4,000 tons.

COMPARISON OF EXPLOSIVES

A recent comparison made by the Bureau of Mines of typical explosives used in American and British coal mines shows that, as judged by the gallery test, the average British "permitted" explosive is safer but has lower explosive strength and is less sensitive to detonation than the average American "permissible." In other words, detonation of a given weight of British explosive is less likely to ignite gas or dust in a coal mine than the same weight of American permissible; provided the British explosive detonates completely. However, the low sensitivity of the British explosives seem to indicate that accidents due to misfires, incomplete detonation, and burning in the bore-hole will be more frequent.

TREND of MECHANICAL DRIVES for COAL MINE SERVICE

By HARVEY B. MANN *

WE have often heard it said by coal men that coal dust is not a bad lubricant, and the number of spur gear drives not properly enclosed in the industry is some evidence of the general belief in this theory. The cement industry is almost totally equipped with enclosed type speed reducers and we are willing to admit that cement is not as good a lubricant as coal dust. On the other hand, wheat, flour and particularly corn meal are better lubricants than coal dust but the cereal industries are also entirely converted to dustproof gear reducers. It might be noticed that flour and corn meal do not contain stone or rock dust. Coal dust, in these respects is more closely allied to cement.

It is not our object in this article to set forth the relative advantages of the various types of reducers, but to enumerate and describe some of their applications in coal mining and to set forth the advantage of the enclosed dustproof reducer compared to open spur gears or to a combination of belt or chain and spur gearing even though such spur gearing is guarded or enclosed as well as local mechanics and facilities permit. We do not believe any practical mine men will contend that the best that can be done in gear guards will be so dustproof that the lubricant will not be rapidly stiffened up and lost on

* Vice President Dravo-Doyle Co., Pittsburgh, Pa.



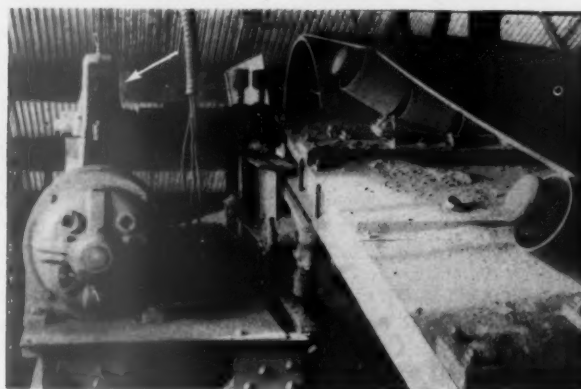
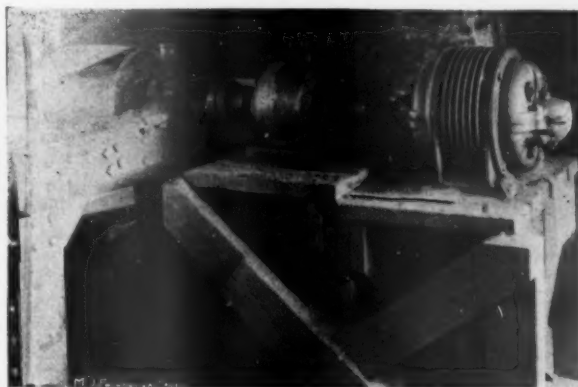
*Spur Gear Reducer
Driving Three Loading
Booms*

Importance Of Lubrication In Gear Reducers—Dust Proof Enclosures For Spur And Worm Gears—Coal Dust Not A Proper Lubricant For Gear And Bearings —Classes Of Mining Machinery Requiring Dust Protection

account of dust collecting and that such enclosures are effective except as guards for the safety of the operator. The combined rope or belt and spur gear drive involves the use of bearings as well as gears exposed to dust. The regular attention to these bearings for lubrication is an item of cost in a plant having a

number of drives. In addition to the objection to spur gears on account of exposure to dust, it should be borne in mind that the cost of installation involving the lining up of the bearings on the gear shafts should be considered. Furthermore, in operation a number of separate bearings not protected from dust must be maintained and furthermore they must be maintained in alignment. With the reducer, the bearings are definitely protected from dust, they are permanently maintained in alignment in the reducer frame, and they are automatically lubricated. It is then argued for belt and rope drives that they offer a measure of flexibility for the protection of the motor. In general, of course, they offer a fire hazard due to sparks from a slipping belt. In so far as they protect the motor by slipping they create this hazard.

One place where the rope or belt drive seemed largely applicable (which we discuss later on) is in fan drives but their use in combination with spur gearing has largely given way to the use of reducers. Nevertheless, in some cases they persist on the ground that they are less expensive. We once remarked to a progressive operator that a certain engineering firm would not buy worm gear reducers because they said they were too good (probably meaning too expensive) for coal mines. His answer: "O H—, nothing is too good for coal mines."



Spur and Worm Gears Driving Conveyors in Dry Cleaning Plants

While the cost of equipment does enter into the consideration of the drive to select, the very wide acceptance of gear reducers in the industry during the past few years seems to prove that—all costs being taken into consideration, particularly upkeep and lubrication, the industry has accepted the speed reducer as an economic advance over open or partially enclosed reductions.

We will not try to differentiate between spur gear reducers, herringbone reducers or worm gear reducers as this is a matter for the engineer selecting the gear for a particular job. He will take into account first cost and particularly space conditions, as often a saving in the cost of building can be made by the proper selection of reducer and such saving in cost of building will of course offset any possible difference in cost of different types. The matter of efficiency should not be given too much weight, as for the same ratio of reduction, there is not much difference in efficiency between the various types due to the fact that the efficiency is a function of oil churning and pumping in addition to gear design.

There is hardly another industry, except perhaps cement manufacture, where machinery to be driven is entirely of such low speed that some form of reduction must be used between the motor and the driven equipment. One of the most widely used mechanical devices in the coal industry is the conveyor for loading underground, for transportation underground, for use in preparation plants and in general for movement through the tipples and to the railroad cars. All types of conveyors and elevators are used for this purpose and they are almost universally driven by means of gear reducers.

It might be remarked in this connection that the low efficiency of the old-fashioned worm is not characteristic of worm gear reducers as now being made by higher class manufacturers and consequently one can not rely offhand upon this inefficiency in considering the worm gear as a brake to prevent an elevator or conveyor starting backwards when stopped under load. In general, the high grade worm gear reducers will offer a braking effect beginning at ratios of 25 to 1, and 50 to 1 may be considered an effective brake for the purpose just mentioned. This would not hold if the load were subject to a jarring action, as in the case of worm gear driven hoists on a traveling crane, but even with a comparatively low ratio, such as 25 to 1, the load would be held against backward travel if it can be prevented from starting, and the ordinary solenoid brake applied to the motor is sufficient for this service even with a straight vertical load as on a crane. In general, the ratio of reduction for a conveyor is more than

25 to 1, and the usual band type, non-reversing brake is not necessary with a worm gear drive.

The lubrication of speed reducers involves the maintenance of the oil at a gauge or cock level indicated by the manufacturer. Except where a shaft stuffing box leaks, which is readily noticeable and easily corrected, there is no need of adding oil between changes. The oil is changed once per year, or shorter period, but this period is seldom less than once in three months. This oil may readily be recovered and will be as good as new, by the use of a small centrifugal purifier. In a coal cleaning plant having 20 to 30 gears, the oil could be changed every three months and the make-up oil would amount to approximately 150 gallons per year.

A worm gear reducer will run hot for the first few weeks of service while the wheel is wearing into the worm. It is impossible to hob the wheel teeth as accurately as the worm is ground. No apprehension should be felt by the user if the temperature stays below 200 degrees F. using the 600W grade of oil usually specified by the gear maker. Lighter oils are suitable for spur or herringbone gearing so the temperature permitted by the manufacturer should be observed.

A number of conveyors are on the market for taking coal from a room and loading into a car in the entry. These conveyors are generally arranged for one or more side conveyors to take the coal from the face to the entry conveyor. A 15 h.p. motor and speed reducer is usually used on the main drive and the face conveyor is driven from the main conveyor. Photograph shown of this type of conveyor is one made by a coal operator for his own mines. It shows a clever arrangement where by using two spur gears between motor and worm gear they get the desired location of the motor. Special construction is necessary in the worm bearings to carry this overhung gear. The spur drive reduction is objectionable on account of exposure to dust, but as no speed reduction is involved it does not reduce the capacity of the worm gear unit.

Underground transportation conveyor systems are in service handling large tonnages over distances of as high as five miles. These large belt conveyor systems are obviously modern and the subject of considerable engineering study before installation. Totally enclosed speed reducers are used for driving them.

Within recent years a number of mines have been installed using conveyor systems on an incline instead of a shaft and a hoist. This is a more efficient method but involves an extra dumping of the coal underground. When the mouth of the mine is at a higher elevation than

the working places and also the tipples, or where it is at a lower elevation than both working places and tipples, it is frequently advisable to terminate the hauling system at the mouth and then convey up or down to the tipples. This involves the use of car hauls for spotting the cars and sometimes the use of a "barney" car driven by continuous chain, speed reducer and motor for starting the trip. Quite a number of gear reducers have been installed for the operation of car hauls. They are particularly applicable for this service on account of the limitations of space and the amount of coal, dust and dirt to which they are subjected.

All types of speed reducers are used for driving reciprocating and apron feeders in tipples and for driving the various types of screens. Rotary dumps of motor-driven type are now coming into general use and most of these are driven by speed reducers. One large operator has installed three rotary slate dumps, on each of which a worm gear reducer is used.

In the tipples a number of loading booms may be driven from one motor with one reducer and in other cases it is advisable to use individual motors and reducers. In some cases the picking table and loading boom are driven with a single motor and reducer.

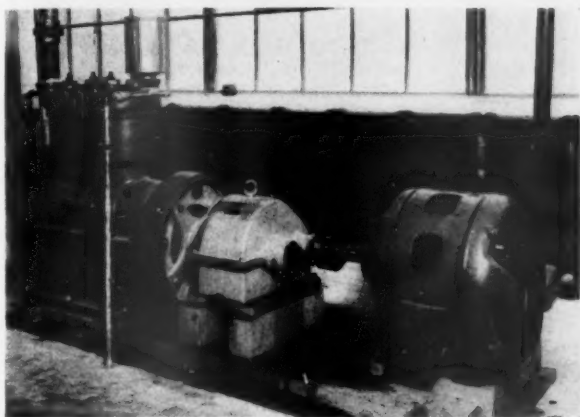
The coal cleaning and preparation plants, both of the wet and dry process, offer a great many motor applications and invariably the use of speed reducers of one type or another. As these plants, in spite of great care and elaborate dust collecting systems are quite dusty, the importance of an enclosure is often greater than underground. We find here, in addition to the flight, scraper and belt conveyors used elsewhere around the mines, bucket elevators and screw conveyors.

One of our illustrations shows a raw coal conveyor drive in a dry cleaning plant, with a supplementary chain drive on the outboard side of the wheel shaft. This drive is for the operation of a brush on the return side of the belt. This is about as good an example of an enclosure such as used on chain drives or spur gears as one will find and yet it obviously is not the protection against dust which continuously operated and lubricated machinery should have.

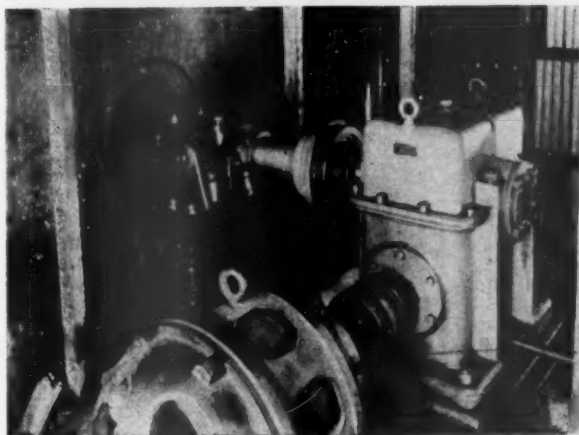
We show illustrations of a spur gear reducer and a worm gear reducer driving belt conveyors in another dry cleaning plant. It will be noted that the heavy framework under the motor and spur gear reducer is not especially tied together to keep these in relative alignment or to keep the reducer in alignment with the head pulley. The only difficulty we have experienced with reducers in any coal mine drives has been due to wooden



Worm Gear Reducer Driving Combined Face and Entry Conveyor and Loader



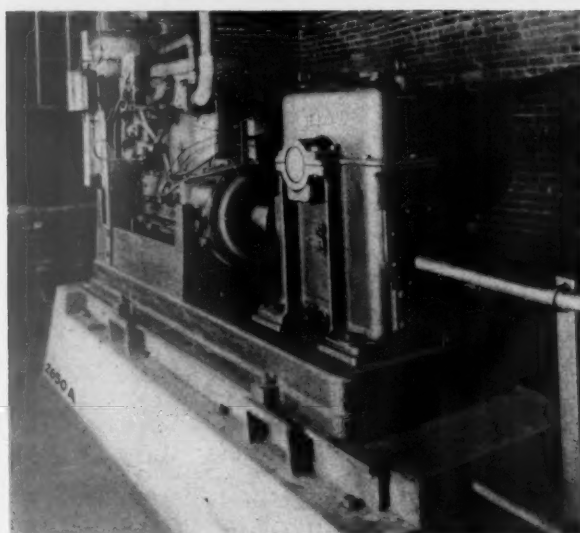
Herring-bone Reducer on Air Compressor



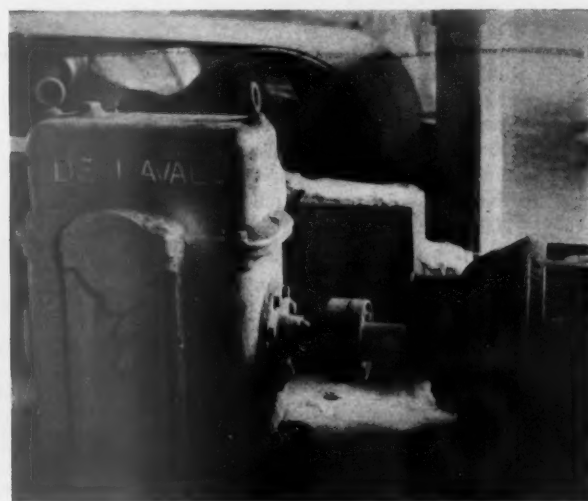
Mine Fans Driven by Worm Gear Reducer



Spur Gear Reducer, Ratio 650 to 1, Driving Powdered Coal Conveyor in Briquetting Plants

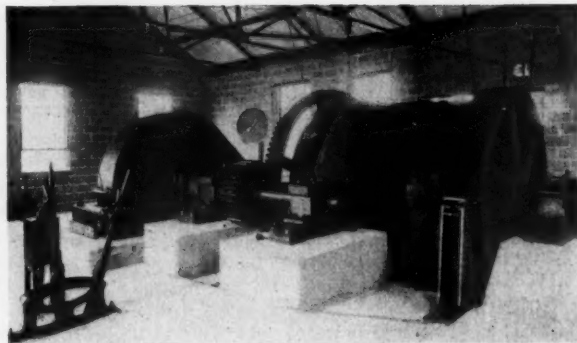
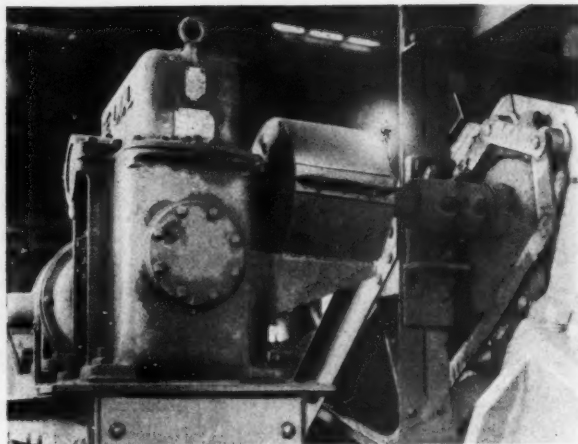


Gasoline Engine Emergency Mine Fan Drive Using Worm Gear Reducer and Belt



Left—Worm Gear Reducer Driving Raw Coal Conveyor and Brush in Dry Cleaning Plant

Worm Reducer Driving Nut Loading Conveyor in Dry Cleaning Plant



Left—Worm Reducer Driving Slack Conveyor in Dry Cleaning Plant

Slope Hoist Drive at Madiera Hill Coal Co., Pa. Herringbone Drive and Flexible Coupling on Motor

supports for motors and reducers. Flexible couplings are not designed to take such misalignment as poor supports produce, without severe wear upon the coupling. The worm gear installation showing the steel supports tied into the conveyor frame is more in line with good practice.

One of our illustrations shows a gear reducer on a mine fan but few are used for this service because operators desire to change the fan speed at some future date and think this can be done more readily at less expense by changing pulley diameter on a belt drive. We believe that in most cases a speed reducer will save enough space and building cost to more than pay for new gears required to change the ratio of the reducer. However, for stand-by drives a speed reducer is frequently used. We illustrate one where a 50 h.p. gasoline engine, mounted on a bedplate with a speed reducer and the whole unit on sliding rails. The pulley is mounted on the slow speed shaft of the reducer and the belt may be put on and the fan driven by means of a second pulley on the fan shaft. The motor for regular operation of the fan may be seen back of and at the end of the gasoline engine. Also the belt shown is from this motor to the fan, the belt from the worm gear not being on the pulley. The arrangement of the speeds and pulleys is such as to drive the fan at about half speed in the emergency when the main supply power is off. This same result is also effected by using a clutch between the end of the fan shaft and the slow speed shaft of the speed reducer.

Among the many miscellaneous applications of reducers about the mines are for the driving of small compressors or for the operation of shaft gates. In briquetting plants numerous reducers are used for the operation of crushers, conveyors and mixers.

Mechanics who are used to seeing open gearing and equipment gradually wear out sometimes react unfavorably to the idea of having the gearing totally enclosed as it is in a speed reducer, feeling from experience that the wear is going on and they can not observe it, so that they are likely to be confronted with a breakdown without any premonition. This attitude is unwarranted as performance of speed reducers in service has proven. The reason is that by enclosing the gears and giving them good lubrication with fixed gear and bearing alignment, no appreciable wear takes place and a good gear, properly selected, will have as long a life as any of the machinery it is called upon to drive. In selection of the gear, sufficient capacity must of course be used, as it does not pay to cut the size of the gear too close to the load as this involves high unit pressures and more chance of damage to the gear in case the oil is not of the proper quality or viscosity. This situation is accentuated due to the fact that the smaller unit will have less radiating surface and may run at a higher temperature, thus reducing the thickness of the oil. It is, of course, important that the buyer carefully consider the equipment offered as to its record of performance and its method of manufacture as well as the experience and reputation of the manufacturer. While all qualities of gear reducers will be offered with prices varying more or less in accordance with the quality, it is possible for the buyer to select good and reliable gearing of any type. His judgment, however, will have to be exercised as to that most applicable for his condition and as to the relative merits of the different types.

In any event, it is not difficult for an intelligent buyer to use speed reducers for driving all slow speed equipment at a considerable saving in maintenance, upkeep and freedom from shutdowns.

DEATH RATE IN COAL MINES SHOWS DECREASE

A TOTAL of 2,224 deaths from accidents at all coal mines in the United States in 1927 is indicated by figures compiled by the United States Bureau of Mines. Of this number, 1,735 accidental deaths occurred at bituminous mines and 489 at anthracite mines. These figures may be slightly increased, the bureau states, on account of a few injuries in 1927 which may yet prove fatal, but as the figure stands at present it indicates a death rate of 3.70 per million tons, based upon the estimated production of coal during 1927. It is believed that the death rate of 3.70 may be increased to 3.73; if so, it still represents an improvement as compared with the death rate for 1926 which was 3.83.

Accidents at coal mines in the United States in the month of January, 1928, caused the loss of 165 lives. Of this number, 140 were killed in bituminous mines in various states, the remaining 25 deaths occurring in the anthracite mines of Pennsylvania.

Fatal accidents at coal mines during February numbered 157 as compared with 190 during the same month last year. Included in the 157 deaths were 123 fatalities in bituminous mines in various states and 34 in the anthracite mines of Pennsylvania. The death rate per million tons of coal mined during the month was 3.35, based on a production of 46,933,000 tons, as compared with 3.23 for February, 1927, based on an output of 58,756,000 tons. The fatality rate for bituminous coal alone for February, 1928, was 2.97, with a production of 41,351,000 tons, and that for anthracite was 6.09, with a tonnage of 5,582,000. The fatality rate for the industry as a whole was slightly higher than in the preceding month and also slightly higher than in February a year ago. The bituminous fatality rate was lower than in the previous month but higher than in February last year.

ARE FLAMELESS POWDERS NEEDED where EXPLOSIVE GAS IS ABSENT

*A Discussion Of This Subject By Six Operators, Showing How
This Subject Is Viewed In Different Sections Of The Country*

S. TESCHER, General Superintendent, National Fuel Company, Denver, Colo., is firmly convinced as to the wisdom of using flameless powders under all conditions, and says:

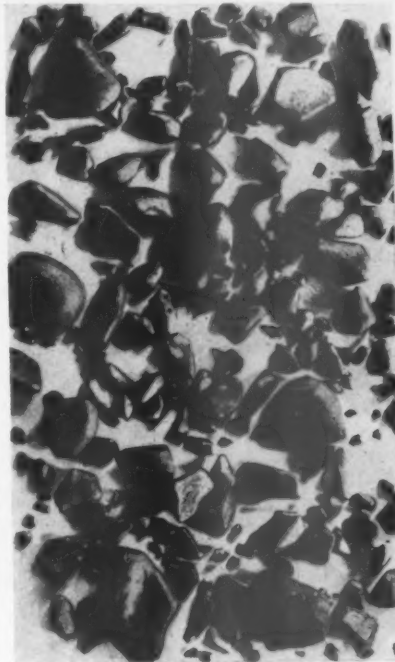
"About the question, 'Are Flameless Powders Needed Where Explosive Gas Is Absent', explosive gas may be found in almost any mine in the country. It is my opinion that in all bituminous mines, whether explosive gas is absent or present, flameless powders should be used. This ruling should not prevail, however, in sub-bituminous mines, lignites, or in longwall workings.

"It would not be necessary to use flameless powder in bituminous mines where all shots are fired from the surface after all employes are out of the mine, and if the operator is willing to risk the shooting of shots with non-flameless powder under the above conditions.

"We know from past experience that a great many mine disasters have occurred from the practice of shooting black powder, and even permissibles when not used in limited amounts prescribed by the U. S. Government. We know also from our experience in Colorado that in 40 years of use of black powder in sub-bituminous mines, which shoot on an average of over a thousand shots per day, no explosions have resulted.

"The sub-bituminous and lignitic coal carries a high percentage of moisture, and occurs in formations that contribute a large amount of non-combustible matter in the suspended dust in the mine air, and in the various lodging places on the mine surface. This scattering of non-combustible matter with the coal dust does not prevail, however, in bituminous mines. In other words, the coal dust and non-combustible matter in bituminous mines are more widely segregated, and the bituminous mines do not carry as large a proportion of non-combustible matter.

"While it is true that even sub-bituminous coal dust can be exploded under the proper conditions, their percentage of ignition from blown-out shots is very low. Permissible mine explosives are being used in nearly all bituminous mines of the State of Colorado, while black powder is being used in sub-bituminous mines and some mines of Colorado that are being operated on the longwall system."



U. S. Bureau of Mines
Black Blasting Powder

JOSIAH KEELY, President, Cabin Creek Consolidated Coal Company, Kayford, W. Va., holds a very different opinion, and asserts that nothing short of a proved necessity would induce the introduction of flameless powder at this property. He defends his position by pointing out that:

"My experience with so-called flameless powders dates from shortly after the great Monongah explosion in 1907, when a large company in the northern part of our state did a lot of experimenting. In those days no one asked any questions about what the company

wanted to do. Permissibles in stick form were introduced, changed, and abolished without even the superintendents knowing what it was all about. Some of the mines had some gas, and a few of them became rather dusty in places. The new explosive was in stick form, and the men soon found out that it cost just about twice as much as the black powder, and 'hung' the shot considerably oftener than the old powder, especially in the 'butt' shots. Various experts came around to prove that the proportion of lump produced was as high as with black powder. It never was. The only approach to it was when an expert with 'safety' was pitted against a novice using the black powder. It was used in so many places where there seemed no need whatever to guard against either dust or gas that it was looked on much as prohibition is viewed by a 'wet.'

"By way of digression, the tendency seems always to have been to supplant a practice, a rule, or a law which can not be easily enforced by another still more difficult to apply, or which entails unnecessary expense and the introduction of new problems.

"For the last dozen years I have been producing coal in a region, a section of southern West Virginia, where the prevailing coals are the No. 2 Gas and such splints as the Coalburg, the Winnifrede, the Lewiston, and the Block 5. Considerable Eagle is also mined in places; a coal much like the No. 2 Gas, but lower in sulphur and ash, and producing a dust which seems quite explosive. Hardly any of these coals have the distinct cleats of the Pittsburgh Seam, so the manner of working and shooting is considerably simpler. Where the Eagle is wet it is sloppy, and where it is dry it is like powder. Gas is rarely present and almost never in explosive quantities. I refer to Kanawha, Cabin Creek, Paint Creek, and Coal River. To order this section of coal fields put on an arbitrary basis of permissible explosives, or rock-dusting, has always seemed a little sweeping. It would be an admission that it was impossible to control the very few dangerous mines. So far as I have been able to determine there has never been a major explosion from any cause in any of these seams except the Eagle. I would certainly take no chances any place in this seam.

For several issues we have been presenting to our readers the views of various operators concerning the use of flameless explosives. The discussion began with the presentation of a paper by Mr. Dan Harrington, safety engineer, United States Bureau of Mines, and has been followed by the views of the practical operating man. This series of short discussions are extremely interesting, and further discussion is invited—
THE EDITORS.

"It might be of interest to cite the difference in the angle observed in this section in regard to the attitude of the men toward permissibles as compared with the northern part of the state, though the lapse of 10 years might account for it rather than the character of the coal. I have found difficulty, in our splint coals, preventing the men from using permissibles, even though it is more expensive. Where the seam is cut in the center, 'Monobel' has been furnished for the bottom shots in wet places, with strict orders to use it nowhere else, but with the most careful supervision the amount of Monobel used indicated that it was continually getting away from us. The introduction of a 'pellet' powder (black powder in stick form) gave us an increase in lump from 5 percent to 9 percent, though it could not be used in very wet places. We found that the difference came about from a disuse of Monobel, except where it was too wet to use the pellets. In this case, it seems that two angles were taken into consideration: First, the sticks of permissibles were so much easier to handle and broke the coal up so much finer that the extra expense was not considered; second, the pellets satisfied the desire for convenience and were enough cheaper than the Monobel to offset the preference of shooting the coal into a shoveling size. Both company and miner profited by the change.

"Where a shot-firer is employed there might be other angles, but the lumpiness of coal shot from our splint seams is of such paramount importance that nothing short of a proved necessity would induce the introduction of the flameless powder."

GEORGE B. PRYDE, Vice President and General Manager of the Union Pacific Coal Company, Rock Springs, Wyo., favors the eliminating of the use of black blasting powder, saying:

"There is much to be said both for and against the adoption of permissible powder in non-gaseous mines, superseding black powder. The proponents of each class of powder bring forward convincing arguments in favor of the powder, whether it be black or permissible, which they consider most suitable for blasting coal.

"Personally, I am in favor of the elimination of the use of black blasting powder in coal mines, because of the many peculiar dangers that exist with the use of this explosive underground. I know personally of several fatal accidents that have occurred from the handling of this explosive. Briefly, the permissible powder has much to recommend it on account of it being safer to handle. The permissible powder has also been the means of eliminating many fires in coal

mines which resulted from the use of black blasting powder.

"I have in mind one particular mine, where several years ago a mine fire developed from several shots fired in an entry with black blasting powder. The fire was not discovered until several hours afterwards, and had gained such headway that the mine had to be immediately sealed. Later, in reopening this mine, a disastrous explosion occurred, causing the loss of a large number of lives, and the property had to be permanently abandoned.

"I know of one company, also, which had numerous underground fires when black powder was used for blasting the coal. Later permissible powder superseded the black powder, and after several years' experience with the latter class of powder not a single instance of fire has developed from the use of permissible powder. This shows one good argument in favor of the use of permissible explosives in coal mines.

"The objection is raised by many operators, who are in the commercial business, that the permissible explosives are unsuitable for blasting coal on account of their shattering effect, causing an increase in the proportion of 'fines.' This may be true to some extent, but I am of the opinion that if proper care is given to the use of permissible powder, by drilling a sufficient number of holes and keeping the charge limit down, that the proportion of fine coal will not be materially increased.

"There are some well-founded objections, of course, to the use of permissible powder, one of the principal ones being that of overcharging, this resulting largely from improper supervision, whereby the miner, instead of breaking the stick of powder to reduce the charge, will generally put in an additional stick so as to be sure to bring down the coal.

"It takes time also to educate employees in the use of permissible powder, because of the definite objections that some miners have to the use of permissible powder, and they never become reconciled to it, preferring the use of black powder to which they have become accustomed.

"It is often difficult, too, to convince the miner that he must tamp the hole to the collar, as with black powder. Certain erroneous opinions seem to have gained credence among miners that very little tamping on the top of a charge of permissible powder will get just as good results as if the hole is fully tamped, and much unnecessary powder is used on this account.

"Another very serious objection often raised against the use of permissible powder is on account of the increased cost, but, from numerous tests made and very reliable figures obtained, I am of

the opinion that, with proper supervision, the cost for blasting with permissible powder is not more than with black powder, in wide work a little less.

"It must be kept in mind that the manufacturers of permissible powders have made remarkable improvements in their product during the last 10 years, and powder of almost any grade can be furnished that will give equally as good results as will black powder.

"I am, therefore, convinced that within a very few years permissible powder will be more largely used in the coal mines of the United States, and it should be used as a matter of safety."

RICHARD A. SUPPES, General Manager, Sullivan Pocahontas Coal Company, Mullens, W. Va., feels that flameless explosives should be made standard. He further states:

"I believe in standardizing on the use of flameless explosives. My opinion is that we do not know at all times and at all places, where explosive may be used, whether explosive gas is present in a dangerous mixture or not. No matter how careful or what precautions we may take, I think we would be taking, otherwise, chances unnecessarily.

"Dust explosions may be caused by the improper handling of long flame explosives. Our coal dust is low volatile, which may not be as treacherous as high volatile coal dust—I do not know—but it presents an explosive hazard that warrants every care, one of the most important of which is certainly to use a permissible explosive.

"The loaders in many mines do their own firing. This, of course, is not good practice, and should be in the hands of some one skilled in that line and well versed in all its possibilities—good and bad. Where so many are responsible a long flame powder should not be used. The long flame powder produces a coarser coal with less care and consideration in following that alone. Permissible powder will shoot coarse coal if properly directed and supervised.

"Its supervision should be no deterrent to its use in view of the reduced liability of catastrophe."

OTTO HERRES, United States Fuel Company, Salt Lake City, Utah, calls attention to the safety rules advanced by the Industrial Commission of Utah:

"You are, no doubt, aware that only permissible explosives are allowed in Utah coal mines by the General Safety Orders of the Industrial Commission of Utah. The regulation in this connection reads as follows:

"(1) Permissible Explosives: Only 'permissible explosives' shall be used for blasting coal in any mine, and the amount of such explosive used in any

one hole shall not exceed the permissible limit of $1\frac{1}{2}$ pounds. A permissible explosive shall be considered as one which has been classed as permissible by the U. S. Bureau of Mines and then only used in such quantities and under such conditions as have been approved by the U. S. Bureau of Mines."

"Under Utah working conditions this regulation appears to me to be advisable to the interests of safety."

The following is the view of an experienced operating man:

"This question has been settled by the Eastern Operating Division of our corporation for about 12 months, and was accomplished by the process of elimination. We, who belong to the commercial shippers, had the problem of the production of lump coal facing us, which was practically as pertinent a question to settle as was the difficulties incident to operating. The production of lump coal is particularly pertinent to the screened coal miners of the low volatile Allegheny series coals of central Pennsylvania. These coals, as you know, are very soft and the preservation of lumps very desirable. On the other hand and from the operating viewpoint, the matter of handling, loading, firing, tamping, ventilation, all of which might better be referred to as safety, had to be taken care of. All of our mines are now using permissible powders with electric blasting caps and permissible batteries. In all our mines, excepting one, shooting is done by the men. At the remaining mine shot-firers are used.

"It has been our experience that permissible powders having a slow rate of detonation, with small flames and low temperatures of short duration, are practically as good for the production of lump coal as are the black powders. While one permissible explosive might work very satisfactorily in one mine, the same permissible explosive will not work in another mine the same coal bed. From the operating viewpoint, the great benefits derived from the safety end, the reduction of accidents, have won us over to permissible powders. Black powders are hard to handle, first at the powder house and second in the mine, particularly due to open lights and men smoking. Miners do not like to buy powder in less than 25-lb. kegs, and while they only take 5 lbs. into the mines with them at a time, the balance is in their possession and subject to hazard. A large mine which sells a cadger of powder each morning has a real problem 'dishing' this out to the men before the man trip leaves in the morning. In loading at the face, if squibs are used, the men will tamp their coal; however, in wet places squibs are impossible and fuse

with its resultant smoke misfires, short fuses, etc., result.

"It has been our experience that where fuse is used the men will cut the fuses short and rarely will they tamp their holes. Since using permissible powder with electric blasting caps and permissible batteries, we have experienced no accidents due to premature explosions.

"Permissible powders properly chosen and tamped with clay and shot with electric blasting caps and permissible batteries have reduced accidents for us and have produced a grade of coal the lumpiness of which is satisfactory. For these reasons we have eliminated all other powders, and I do not believe we will ever go back to them."

ROCK DUSTING MAKES PROGRESS

A RECENT survey by the Bureau of Mines shows that 239 companies in the coal industry of the United States are rock dusting their mines as a safeguard against explosions. This figure, representing 463 separate mines, compares with 92 companies, or 177 mines, which were using rock dust in the fall of 1925, an increase of about 160 percent. This appears to be a decidedly healthy increase, says the bureau, but when it is considered that there are approximately 7,100 bituminous mines operating and that there were only 463, or $6\frac{1}{2}$ percent, which were even reported to be using rock dust to any extent whatever, the foregoing figures as to progress leave much room for improvement.

A more favorable aspect of the situation is that the annual output of the mines using rock-dust in the summer of 1927, when the more recent survey was made, was over 137,000,000 tons, as against about 54,000,000 tons in 1925, hence the mines now using rock-dust produce about 24 percent of the country's bituminous coal. The fact that mines using rock-dust represent but about $6\frac{1}{2}$ percent of the total number of operating mines, yet produce about 24 percent of the tonnage, shows that it is the larger capacity mines which are progressive as to this precaution. Mines using rock-dust in the summer of 1927 employed about 109,000 underground workers out of a total for the United States of about 510,000, hence only about 21 percent of the underground workers in the bituminous and lignitic mines are being given at least partial protection by rock-dusting. The rock-dusting survey made in the fall of 1925 indicated that mines using rock-dust employed about 50,000, hence an additional 60,000 were brought under protection by rock-dust since that time.

In 1925 it was found by careful inquiry that rock-dust was used in mines in 13

states, while in 1927 this method of mine protection had been extended to 17 states. The states in which most general attention has been given rock-dusting in proportion to the total number of mines operated are, in order: Utah, with 100 percent of the mines reported as using rock-dust; New Mexico, with 43 percent; Wyoming, with 31 percent; Alabama, with 23 percent; and Colorado, with 14 percent.

Pennsylvania, with 129 mines using rock-dust, heads the list of states in number of mines taking this precaution against widespread explosions; West Virginia is second with 89, Alabama third with 52, Utah fourth with 38, and Colorado fifth with 31; then follow Illinois with 25, Wyoming with 19, and Kansas and Kentucky with 18 each.

Although the situation as regards rock-dusting in coal mines has improved much from that in 1923, when scarcely a dozen mines in the United States were using rock-dust, in 1925, when 177 mines used it and in 1927, when the total was 463, numerous phases of the situation are still by no means encouraging, says the bureau. Several states have enacted laws or regulations on rock-dusting, but in general they are not effectively enforced. Although the recent survey indicates that rock-dust is being used in 463 mines in the United States, it is decidedly improbable that 50 of these mines are adequately rock-dusted. Bureau of Mines field men have reported a number of mines as being at least fairly well protected from widespread explosions where combined rock-dusting and watering systems are in use, but there have been few if any mines reported as being adequately rock-dusted where dependence is placed on rock-dusting alone. Moreover, there are very few mines in which anything like adequate measures are employed, to ascertain definitely whether rock-dusting which has been done is or ever was of such nature as to prevent or to limit an explosion.

All coal mines, other than high-grade anthracite, should be rock-dusted unless they are decidedly wet throughout, the Bureau of Mines declares.

In such mines all open accessible parts (including air courses, abandoned rooms, pillars, crosscuts, etc.) which are not decidedly wet should be kept rock-dusted to such an extent that any dust to be found on ribs, roof, floor, or timbers will have an incombustible content of 65 percent or over.

Further details are given in Serial 2856, "Status of Rock-Dusting in the United States," by D. Harrington, J. J. Forbes and F. Feehan, which may be obtained from the United States Bureau of Mines, Department of Commerce, Washington, D. C.

REPORTS ON THE MECHANIZATION SURVEY

Anthracite Mining With Scrapers And Conveyors In Thin Seams—Pitches From Two To Twenty Percent—Entries, Rooms And Longwall Retreating—Mining Methods And Conditions Somewhat Similar To Certain Bituminous Seams

By G. B. SOUTHWARD

THE adaptation of scrapers and conveyors to thin seams of coal has been somewhat in the nature of an evolution in anthracite mining as compared to the more abrupt change or departure from mine car methods in mechanizing bituminous mines. For example, in pitching anthracite seams it has long been the practice to slide the coal by gravity down sheet iron chutes or plates from the face of a room to mine cars on the haulageway. When the pitch of a seam flattened so that the coal would not run by gravity it was no great departure to install a shaking chute or conveyor to replace the stationary plates formerly used. Similarly, the substitution of a scraper to assist the coal to flow did not involve any radical change in the mining method. This does not imply that the adaptation of scrapers and conveyors in anthracite mining was simply a matter of installing equipment because it is a proven fact that any change from existing practices, no matter how slight, always encounters difficulties which did not previously exist and in the mechanization of anthracite mines much intelligent effort has been required to solve the problems which were encountered. Improvements are continually being made which are tending to concentrate the mining areas and coordinate the various mining operations and a number of interesting and successful methods have been developed for applying mechanized equipment.

The four reports on mechanized mining—Numbers 429, 31, 229, and 227—which are submitted with this issue show scrapers and conveyors applied to thin seams in anthracite coal. Two of these mines are using scrapers in room work, one is using conveyors for entry advancement and room mining and the fourth has scrapers on longwall faces. The seams vary from slightly more than 3 ft. to less than 2 ft. in height; three of the veins are nearly flat—from 2 to 6 percent—and Number 31 pitches from 15 to 20 percent. In all these operations the haulageways are driven on the level; bottom is taken for height along the roadways but not in the rooms and no top is taken in the rooms with the exception of operation No. 31 where a bone strata immediately over the coal is shot down and gobbed inside. Some small partings occur in the seams but little at-

The anthracite coal beds occur under a wide divergence of physical conditions and in the thick pitching seams the mining problems and practices are not at all comparable to those in the bituminous fields. However, in the thin flat anthracite seams the conditions are not greatly dissimilar to those found in many of our bituminous mines and the working methods employed do not vary greatly from practices found in bituminous mining. It will, of course, be understood that this is speaking more or less generally as there are certain fundamental differences existing which put anthracite and bituminous mining into two separate and distinct classes and direct comparisons cannot be made. However, in the adaptation of mechanization to thin veins there are a number of points of similarity in both classifications of coal and the four reports on mechanized mining in thin veins of anthracite described in this issue are submitted as being of interest to both anthracite and bituminous coal mining men.

tempt is made to hand pick inside as adequate preparation facilities for coal cleaning are installed on the surface.

Report No. 429 describes a scraper operation in room work in a seam 3 ft. and less in height pitching from 2 to 6 percent. Five rooms are advanced as a unit by one scraper installation; no particular difficulty is involved by the system of sheaves required to operate the five rooms from one hoist set, and no great delay is encountered in changing the operation and the equipment from one room to another. The face of each room is slightly angled and the tail sheave is set in the back corner so that there is a tendency for the head rope to pull the scraper into loose coal along the face.

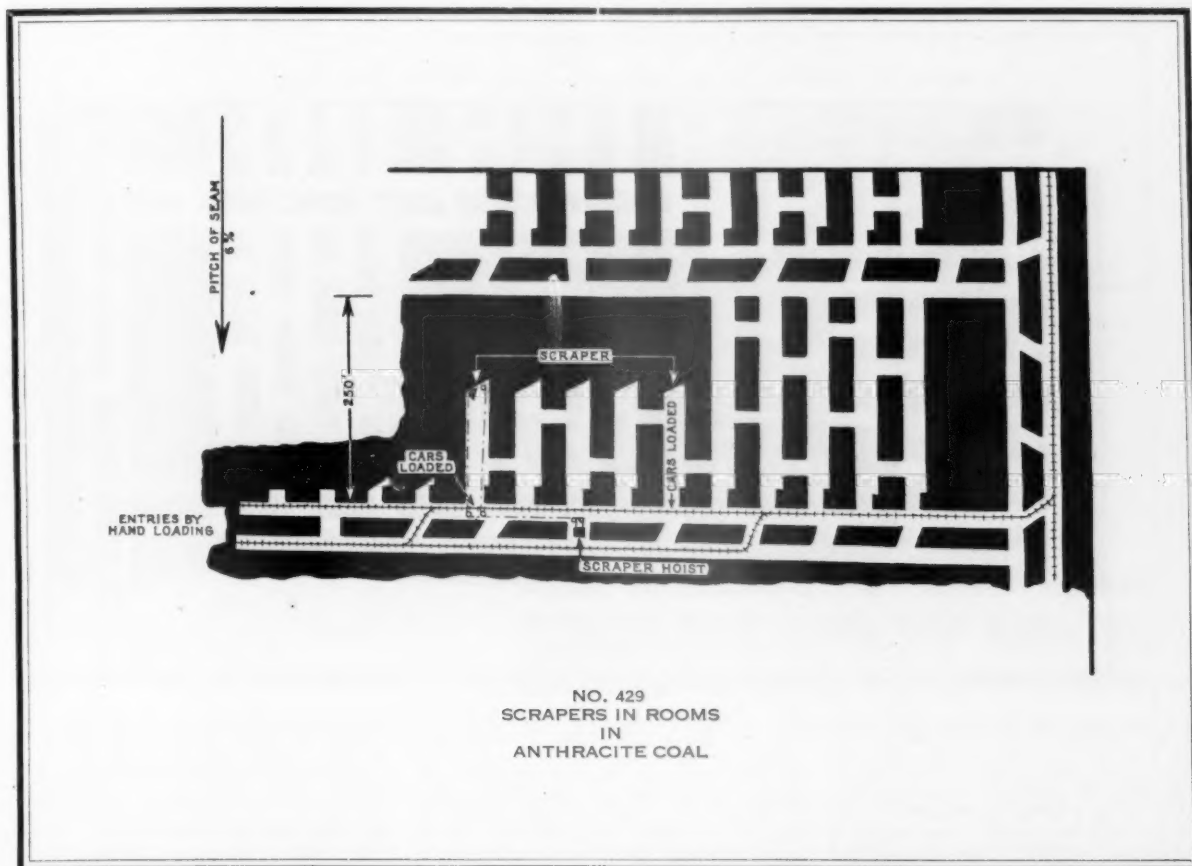
Operation No. 31 is very similar in plan to that shown in No. 429. This seam is slightly more than 3 ft. in height and pitches from 15 to 20 percent. Five rooms are worked as a unit by one scraper installation but the hoist instead of being set in one location is mounted on a portable truck. This truck runs on its own track which is laid on the lower side of the entry parallel to the mine car haulage track and is moved so as always to be directly opposite the neck of the room which is being loaded. This is a very convenient arrangement as the hoist operates very efficiently from the truck and is moved from one room to another by a gathering locomotive or can be pushed by hand if required.

In this operation the coal, after being shot, is shovelled by hand away from the face and toward the center of the room where it is reached by the scraper which travels in a straight line from the face to the room neck. No attempt is being made to swing the scoop or cause it to travel parallel to the face of the room.

Operation No. 229 shows the application of conveyors to room work and entry development in a seam 30 in. in thickness pitching about three degrees. At this mine the first use of conveyors was in driving single rooms and the results that were had in this work led to the design and adoption of a plan for consolidating several rooms as an operating unit as shown in this report. In this plan a single entry is advanced with a conveyor which is handloaded at the face and discharges into mine cars on the haulageway. Several rooms are turned off of this single entry, advancing with conveyors which discharge onto the single entry conveyor. In this manner the coal from an entry and its rooms is collected and loaded into mine cars at one central point. From 3 to 4 ft. of bottom rock is taken for height along the haulageway; in the single entry about 2 ft. of bottom is taken to give head room for a more convenient working clearance and travelling way, but in the rooms no top or bottom is taken up. This method has not been in use for a great while at this mine but the management considers that it has passed the experimental stage and it will probably be adopted as their standard system of conveyor mining.

Report No. 227 describes a scraper operation in longwall mining in a seam 24 in. high pitching about four degrees. The scraper is operated by a rope hoist set along the haulageway and at some distance back from the end of the face so that only periodic moves are required. The faces are worked retreating and are developed by a short wall face which is driven advancing with a packwall that serves the same purpose as the chain pillar in a double entry system. The roof is supported out from the face by cribs and posts which are not recovered but are crushed and broken as the roof caves or subsides. This system has been used for over a year and a considerable area has been mined by longwall.

Report No. 429



PHYSICAL CONDITIONS: The seam varies from 20 to 36 in. in height with a bone parting from 2 to 4 in. in thickness. Sandstone top which stands well in the entries and rooms. Hard slate bottom. The seam pitches from 2 to 6 percent. Cover 800 ft. Open lights.

MINING SYSTEM: Room and pillar advancing with scraper loading in the rooms and the entry development by hand loading into mine cars. About 3 ft. of bottom is taken for height in the entries, but no bottom is taken in the rooms. Rooms are 26 ft. wide on 60-ft. centers and are driven 250 ft. long up the pitch and through to the air course in the adjoining panel. A block of five rooms is taken as an operating unit and are advanced abreast and completed before the next rooms ahead are started. No pillars are at present being recovered by the scrapers, but it is the intention to take these retreating after the first mining is completed.

MECHANICAL OPERATION: A scraper drags the coal from the face of the room down to mine cars along the haulway. The block of five rooms is worked by one installation with the hoist set along the haulway opposite the neck of the middle room. The scraper is moved from one room to another as the loading is completed, and the ropes are carried on sheaves along the haulway and up into the room which is being worked. The face of each room is slightly angled and when loading is

started in a room the back corner is cleaned out and the rear sheave jack is set in close to the solid coal. This pulls the scraper into the loose coal along the face and eliminates some hand shoveling.

At the room neck along the haulway a short bridge or chute is laid from the bottom of the room out over the top of the mine cars, so that the scraper loads directly into the cars. These are of 2½-ton capacity and are placed in trips at the discharge point by a gathering locomotive. These are dropped down one at a time by hand while loading, but at times a mule and driver is required when the grades are adverse. A single track with 40-lb. steel on 36-in. gauge is laid on the entry with a run-around switch through the air course.

The face is drilled 6 ft. deep with compressed air jackhammer and the coal is shot off the solid using permissible explosive with electric timer caps. About 16 shots are required in each room.

TIMBERING AND ROOF ACTION: The roof in the rooms generally stands well, but two posts are set with each 6-ft. advance. No pillars are at present being recovered by scraper mining.

OPERATING CREW: All work is done on the day shift of eight hours by a crew of nine men, consisting of one foreman, one hoist operator, two facemen, one signal man, two drillers and shot firers, and two car trimmers. All op-

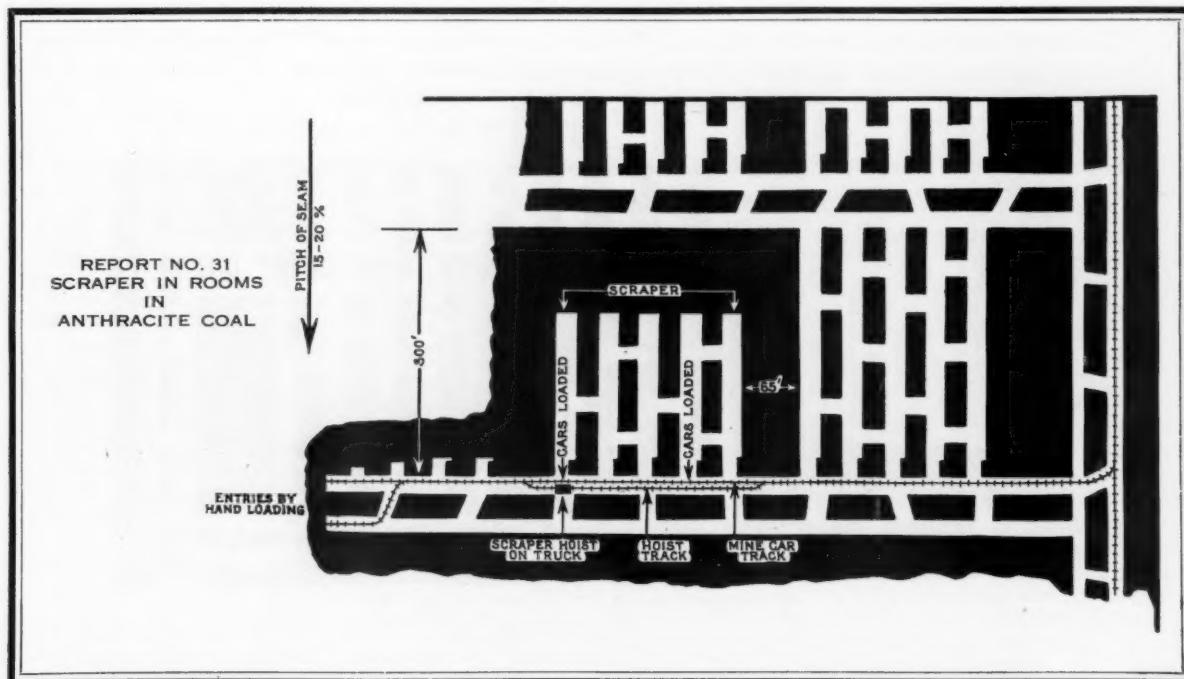
erations are carried on more or less continuously with the loading following directly behind the preparatory work. Each room cut produces about eight cars of coal and usually three rooms are loaded out during a shift by the crew described above. Additional work is required for track laying, car haulage and entry development, and at times the grade along the haulway requires a driver at the discharge point of the scraper. This extra work is done by men outside of the regular loading crew.

EQUIPMENT: Each operation uses one scraper installation complete with hoist and sheaves and one compressed air jackhammer.

PREPARATION: Some hand picking is done inside the mine by the car trimmers at the scraper discharge. The management reports that there is no marked increase in the amount of slate produced from scraper mining as compared with hand loading into mine cars, and they also report that a satisfactory percentage of lump sizes is produced from the scraper operation.

CONCLUSION: Scrapers have been used at this mine for more than two years and about 30 percent of the total mine output is loaded by this type of equipment. The management reports that the scraper loading is on a satisfactory operating basis and has demonstrated its practicability in mining a seam which is too low for economical operation with mine cars.

Report No. 31



PHYSICAL CONDITIONS: The seam has an average height of slightly more than 3 ft. of coal with a strata of bone immediately above which ranges from 15 to 20 in. in thickness. The top above this is a hard slate which stands well without much timbering. The bottom is a hard clay or slate. The seam pitches from 15 to 20 percent. Cover approximately 300 ft. Open lights.

MINING SYSTEM: Room and pillar advancing with scraper loading in the rooms and the heading development by hand shoveling into mine cars. In the headings the top bone and some bottom rock is taken for height; in the rooms no bottom is taken. After the coal has been mined and loaded out the top bone is shot down full width of the room so as to produce a cleaner product. The top and bottom rock taken in the headings is hauled to the outside. The bone taken down in the rooms is gobbled along the ribs.

The headings are 12 ft. wide, airways (where loading tracks are) 14 ft. wide with a 30-ft. pillar between them and driven on the level; the rooms are 22½ ft. wide on 45-ft. centers and are driven up the pitch 300 ft. long through to the air course in the adjoining panel. Five or seven rooms are worked at one time on a heading and are advanced abreast. These are driven up and completed before the rooms in the next block ahead are started and a solid pillar 65 ft. thick is left between the blocks to insure protection to the workings during the first mining. No pillars are at present being recovered by the scrapers as the plan is to work these retreating from the panel limit after the first mining is completed.

MECHANICAL OPERATION: After a face has been shot down the loose coal is shoveled by hand away from the face and toward the center of the room where it can be reached by the scraper.

The scraper drags the coal from the face of the rooms down to mine cars along the haulway and is operated by head and tail ropes from an electric rope hoist. One scraper installation works a block of five or seven rooms and the hoist is mounted on a portable truck which is moved along the haulway so as to be opposite the neck of the room that is being loaded. The hoist truck runs on a separate track which is laid parallel to the mine car haulage road.

Bottom is taken along the haulway, but not in the rooms, so that the top of the mine car, when placed at the room neck, is nearly level with the bottom of the seam. A chute or bridge is set at the mouth of the room across which the scraper discharges directly into the mine cars. These are about 2-ton capacity and are set in trips of 15 by a gathering locomotive and are dropped past the scraper loading point one at a time by hand. A track of 25-lb. steel on 36-in. gauge is laid along the haulway for the mine cars and another track paralleling this is on the lower side of the heading for the hoist truck. The coal is not undercut, but is shot off the solid, using about 12 shots in each room. These are drilled by a compressed air jackhammer and fired with permissible explosive and electric firing. About three sticks of explosive are used in each shot.

TIMBERING AND ROOF ACTION: The top in the entries and rooms stands well and no regular timbering is required except occasionally when some bad top areas are encountered. No pillars are recovered on the first mining, but it is expected to mine these retreating some time in the future.

OPERATING CREW: A block of five rooms is operated as a unit by one crew, which does all work of loading, drilling, shooting on the day shift of eight hours. No regular work is done on the night shift. These men are divided into two

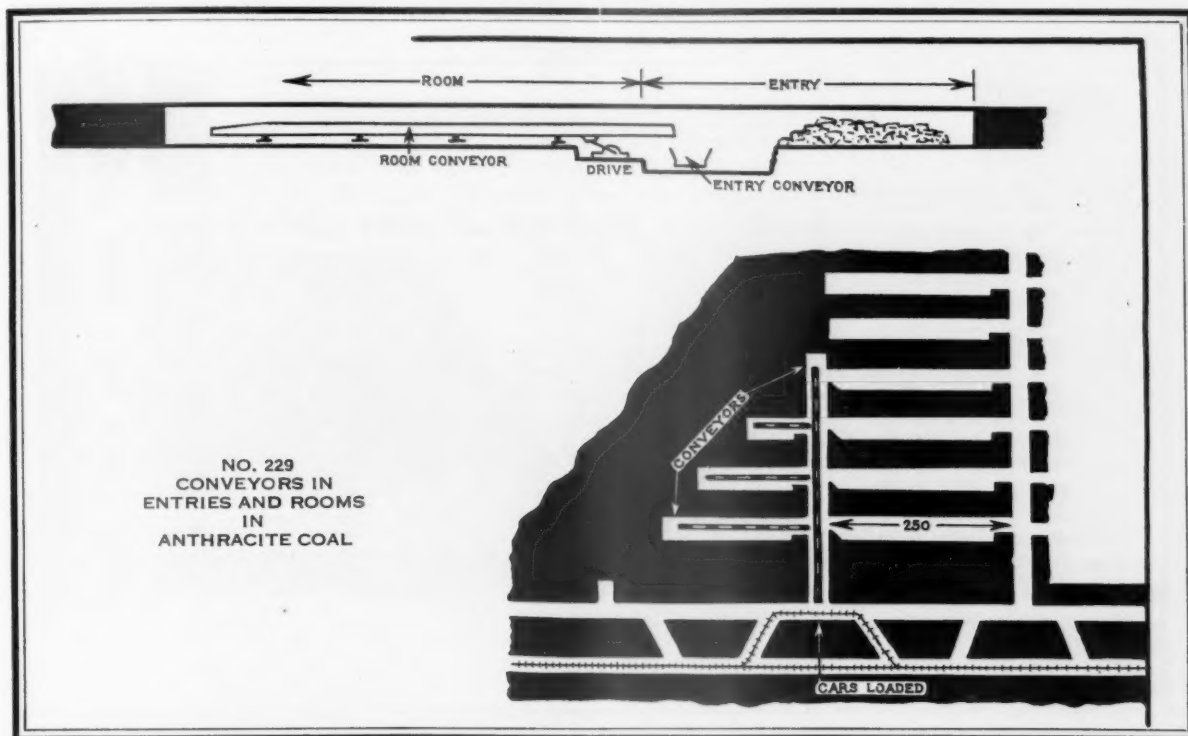
crews, a loading crew of five men consisting of two facemen to guide the scraper and set the face jacks, two car trimmers and droppers and one hoist operator. The preparatory crew usually has seven men who do the drilling and shooting and take down the gob or bone top in the rooms. In addition to these men there is a locomotive crew of two men who deliver the cars, but this crew also serves other work. Usually a block of five rooms is loaded out each day and each room will produce from seven to eight cars on an average.

PREPARATION: No hand picking is done inside the mine. The sizes produced from the scraper mining depend entirely on the care with which the shooting is done and the management is devoting considerable thought and effort toward standardizing their blasting methods. The quality now produced is in general satisfactory, but some further improvement is expected.

EQUIPMENT: Each operating unit has one scraper complete with ropes, sheaves and a portable hoist, one compressed air jackhammer drill and one gathering locomotive, which also serves other work.

CONCLUSION: Scrapers were installed at this mine about two years ago and have been on an operating basis practically since the first installation. About 25 percent of the mine output is now loaded by scrapers and the management considers that this operation is mining successfully under conditions which would be very expensive, if not prohibitive, for hand loading into mine cars. The amount of tonnage produced by the scrapers is restricted by the present rate at which the headings can be advanced with hand loading and means are now being considered for advancing the entries mechanically in order to hasten the development and increase the output from the scraper mining in the rooms.

Report No. 229



PHYSICAL CONDITIONS: The seam is about 30 in. in height and has two small partings varying from 1 to 2 in. thick. The top is usually a sandstone which stands in an ordinary room width without timbering, but occasionally a slate top is encountered which requires posts with cross bars. The bottom is a medium hard shale and is taken up for a depth of 3 ft. for height along the haulways. The seam pitches about 3 degrees. Cover approximately 200 ft. Open lights.

MINING SYSTEM: Room and pillar advancing with hand shoveling on conveyors in the entry advancement and the room driving. An operating panel consists of a single entry turned to the raise off of a level haulway with several rooms worked advancing off this single entry. Each room has a conveyor which discharges onto a conveyor laid in a single entry and the single entry conveyor serves its own advancement and also acts as a haulage conveyor for the coal mined from the rooms. By means of this arrangement all the coal from the rooms and from the entry is loaded into mine cars at one central point along the level haulway. The single entry is driven 22 ft. wide and about 2 ft. of bottom rock is taken for clearance along one side for the conveyor-way. This rock is gobbled along the side of the entry. The rooms are 24 ft. wide on 60-ft. centers and are driven 250 ft. through to the next single entry ahead.

MECHANICAL OPERATION: All conveyors are a sectional shaking type, but the haulage conveyor is larger and has a greater carrying capacity than the room conveyors, so that two or more places may be loading at the same time. The haulage conveyor and each room conveyor have separate electric motor drives, but are all started and stopped by control switches centralized at the

discharge point on the haulway. A single entry with several rooms is operated as a unit. At present three rooms are being advanced in a panel, but it is expected that this number may be increased in the near future. All operations, such as loading, drilling, shooting, and extending the conveyor, are carried on more or less continuously during the working shift, and while one place is being loaded out the preparatory work is carried on in another.

At the discharge end of the haulage conveyor cars are placed three at a time by mule and driver. These cars are of 2½-ton capacity and are dropped past the conveyor discharge one at a time by hand. A single track on 42-in. gauge of 25-lb. steel is laid along the haulway.

The coal is not undercut, but is drilled with compressed air jackhammer and shot off the solid. Seven shots are usually fired in each room, using three sticks of explosive per shot.

TIMBERING AND ROOF ACTION: Where the top is a sandstone, no timbering is required, but certain areas are encountered which require careful timbering. No pillars are being recovered by conveyors at present, but it is expected to take these retreating after the first mining in the panel is finished. The mining in the panel is finished.

OPERATING CREW: All work is done on the day shift of eight hours, and the shooting is usually done at the end of the shift, so that the smoke will be eliminated during the working time. A crew of four men is employed to perform all the regular operations from the face to the haulway, such as loading, drilling, extending the conveyors and loading the mine cars. These men work where required, under the direction of a working boss, and usually clean up the entry, which includes taking bottom for the conveyor-way, and load out one room

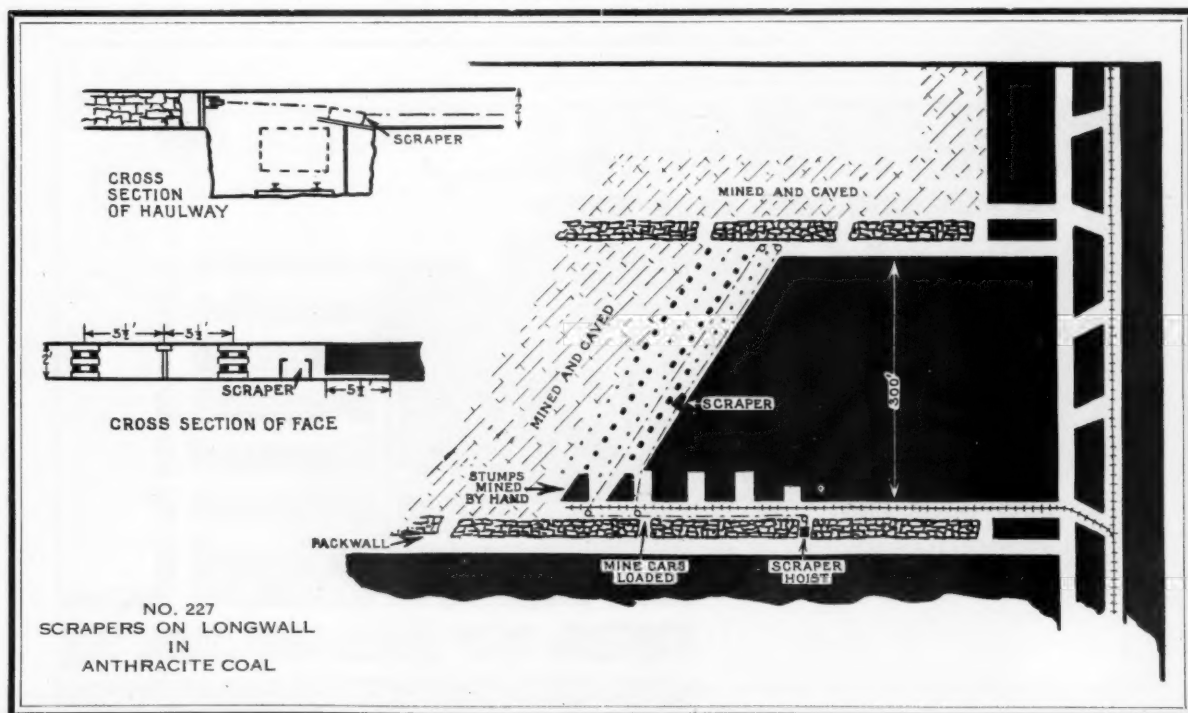
during the shift. This produces about eight cars of coal on an average. Other labor required for hauling mine cars and delivering them to the conveyor discharge point, extending the track and timbering is done by men outside of this regular working crew.

EQUIPMENT: Each operation uses one large type shaking conveyor for the single entry and three smaller type shaking conveyors for the rooms. Each of these has a separate electric motor drive and the equipment includes wiring and switches, all the conveyor controls located at a central point on the haulway.

PREPARATION: Some slate picking is done inside the mine, but the management reports that the quality and the sizes of the coal from their conveyor mining compares favorably from that of their hand mining under similar conditions.

CONCLUSION: Conveyors have been used at this mine for nearly two years, and for the last year they have been considered on an operating basis. This mine produces about 40 percent of its output from conveyor mining, and while most of these are now used for single room advancement the system described in this report has proved satisfactory, and it is expected to be adopted as standard for their conveyor work. The advantages of a central loading point for several conveyor driven rooms are very evident in reducing the gathering haulage and simplifying car placing and movement. It is expected that the system now used will be enlarged in the near future and that more than three rooms will be worked as an operating unit, although the exact number has not yet been determined. It is also expected to substitute a storage battery locomotive in place of mule and driver now used for delivering cars to the conveyor discharge point.

Report No. 227



PHYSICAL CONDITIONS: The seam has an average height of about 24 in. and is generally free from any regular partings. The top is a slate which stands well without much timbering. The bottom is a hard clay or slate. The seam pitches about 4 degrees. Cover approximately 200 ft. Open lights.

MINING SYSTEM: Longwall retreating with face scrapers. The panel is developed by a short face 60 ft. long which is driven advancing from the main haulway to the panel barrier. Bottom rock is taken up for a width of about 12 ft. along the upper side of this face to provide a mine car haulway and the rock is gobbled and packed on the lower side of the haulway, leaving a clear space along the lower rib of the shortwall face which serves as an airway for the panel. In other words, the packwall replaces the chain pillar in a double entry system. When the shortwall face has driven to the panel limit, a longwall face 300 ft. long is started on the upper side and works retreating toward the main entry. The face is angled back about 60 degrees to the haulway, and as it retreats it cuts into short single entries somewhat equivalent to room necks, which have been driven off the haulway about 40 ft. into the solid coal. This provides a scraper outlet from the end of the face to the haulway, and each one is used for several cuts until the face reaches into the next entry ahead. By this means small stumps of coal are left unmined on the upper side of the haulway and hold the haulway open for a sufficient distance, so that a trip of empty mine cars may be placed behind the scraper discharge point. These stumps are usually left in for about 100 ft. back of the face and are recovered by hand loading into mine cars.

MECHANICAL OPERATION: A scraper is used to drag the coal from along the face in both the shortwall and

the longwall work and loads into mine cars on the haulway. As bottom is taken along the haulway at the end of the face, the top of the mine cars is about level with the bottom of the seam and a short bridge or chute extends from the end of the face out over the mine car for the scraper discharge. The scraper is moved by head and tail ropes operated by a two-drum electric rope hoist. This is set at one side of the haulway and back from the end of the face and is moved periodically as the face retreats.

Mine cars of about 2-ton capacity are placed at the scraper discharge point in 10 to 14-car trips by an electric gathering locomotive. On the longwall work the trips are delivered to the tail track beyond the end of the face and are dropped by hand past the scraper discharge one at a time. A single track of 20-lb. steel on 36-in. gauge is laid along the haulway. On the advancing shortwall face the cars are delivered to a cross cut close to the face and are pushed up to the scraper discharge by hand.

The coal is machine undercut $5\frac{1}{2}$ ft. along the face and is drilled with a compressed air jackhammer. The holes are placed about 8 or 10 ft. apart along the face and are fired with 20 percent dynamite.

TIMBERING AND ROOF ACTION: The roof is worked subsiding with cribs and timber posts as supports along the face. These are set in one row after each cut 3 ft. apart; the first line being 5 ft. from the face before the coal is shot down. Cribs are used along one-half of the length of the face and posts along the remaining half and this position is alternated with every cut. No timbers are removed or recovered, but are gradually crushed by the roof weight as the top subsides. The coal stumps left along the haulway are crushed to quite

an extent before they are removed by hand mining, but the management reports that these are usually all recovered and the coal lost in the pillars is negligible.

OPERATING CREW: On the longwall face the work is carried on day and night shifts, both being eight hours long. Loading is done during the day and the other operations, such as cutting, timbering, etc., is done at night. A day crew of five men is usually employed, these consist of one hoist operator, two car trimmers and droppers and two men along the face to guide the scraper. The night crew has seven men to do the cutting, timbering and other preparatory work for the day loading. A gathering locomotive crew of two men serve the operation. Usually a face cut is completely loaded out during the day shift and this produces an average of from 30 to 40 cars per day.

PREPARATION: No slate picking is done inside the mine and the management reports that the percentage of lump sizes obtained from the longwall mining compares favorably with that from hand loading into mine cars.

EQUIPMENT: Each face operation uses one scraper complete with ropes, sheaves and 2-drum electric hoist and one compressed air jackhammer drill and one undercutting machine.

CONCLUSION: Scrapers were installed at this mine about two years ago and the longwall mining has been on an operating basis for about 18 months. The management considers that this method of mining has proved successful in enabling them to mine a seam profitably in which the height is so low that the cost of operating by hand loading into mine cars would probably be prohibitive. At the present time a considerable tonnage at this mine is loaded by scrapers or conveyors.

SOUTHERN DIVISION CONFERENCE

Gulfport Meeting Opposes Government Operation Of Industries—Tariff As Aid To Mineral Development Urged—Work Of American Mining Congress Endorsed—Southern Mineral Resources For College Study—Atlanta Invites 1929 Industrial Development Conference

AT TENDED by official delegates by appointment of State Governors, and industrial leaders from the North, East, and West, the Third Annual Industrial Development Conference which was held by the Southern Division of the American Mining Congress at Gulfport, Miss., March 15-17, again focused the attention of the country on the latent possibilities of a vast mineral empire in the southland.

As a result of the deliberations of the Conference, decision was reached to carry to the country the possibilities of profitable investments in southern minerals and to place in the courses of study of the colleges of the country as a textbook the report just issued by the American Mining Congress on the "UNDEVELOPED MINERAL RESOURCES OF THE SOUTH."

Ringier declaration was made by the Conference against the invasion by the Government into the operation of industries which are essentially the field for private initiative.

Dr. A. V. Henry, of the Georgia School of Technology, was elected chairman of the Board of Governors of the Southern Division, and extended on behalf of Governor Hardeman, of Georgia, an invitation to the Conference to hold its 1929 session at Atlanta. Dr. Henry Mace Payne, consulting engineer to the American Mining Congress, and author of the mineral resources publication referred to above, was reelected secretary of the division. The following were elected members of the Board of Governors of the division:

Alabama, Erskine Ramsey, of Birmingham; Arkansas, Judge J. H. Hand, of Yellville; Florida, Leadley Ogden, of Sarasota; Georgia, Dr. A. V. Henry, of Atlanta; Kentucky, C. J. Neekamp, of Ashland; Louisiana, Col. W. H. Sullivan, of Bogalusa; Mississippi, R. G. Brown, of Louisville; North Carolina, Maj. Wade H. Phillips, of Raleigh; South Carolina, E. L. Hertzog, of Spartanburg; Tennessee, H. I. Young, of Mascot; Texas, H. M. Madison, of Houston; Virginia, M. J. Caples, of Norfolk.

The Georgia delegation to the convention in a resolution declared that "the greatest permanent good for the South and the Nation will result from these meetings."

Howard A. Smith, of Montgomery, Ala., was chairman of the resolutions committee. The resolutions will be found at the end of this article.

The sessions of the Conference were held at the Hotel Markham. R. G. Brown, retiring chairman of the Board of Governors, presided at the opening session, which was begun with prayer by Rev. Dr. W. A. McComb.

In responding to the address of welcome by Commissioner Bura Hilbun, representing Governor Bibbs, J. F. Callbreath, secretary of the American Mining Congress, referred to the aims and objects of the organization in stimulating the development of the mining industry for the benefit of the operator, miner, public, and the country at large.

Reports on mineral resources and industrial development were made by representatives of the states as follows:

Alabama—Hon. Howard C. Smith, Chief of the Division of Industries, Montgomery; Arkansas—Hon. J. H. Hand, White River Chamber of Commerce, Yell-

Coal Association, Ashland; Louisiana—Hon. W. F. Chisholm, Director of Minerals Division, Department of Conservation, Shreveport; Mississippi—L. J. Folse, manager, Mississippi State Board of Development, Jackson; North Carolina—Maj. Wade H.

Phillips, director, Department of Conservation and Development, Raleigh; South Carolina—E. L. Hertzog, mine operator, Spartanburg; Tennessee—Charles C. Gilbert, secretary, Tennessee Manufacturers Association, Nashville; Texas—J. H. Little, superintendent, M.-K.-T. R. R., Waco, Virginia—M. J. Caples, vice president, Seaboard Air Line, Norfolk; West Virginia—Carl Scholz, past president, the American Mining Congress, and Raleigh-Wyoming Mining Company, Charleston.

In a message to the conference, Richard H. Edmonds, editor of the Manufacturers Record, of Baltimore, predicted that the South would soon become "one of the great industrial and agricultural sections of the world." Mr. Edmonds stated that diversification is the only sure road to agricultural prosperity and that diversity in industry is equally important. Mr. Edmonds referred to the "almost limitless resources and advantages" of the South and its suitability for the widest diversity of agriculture. "The whole spirit of agriculture is undergoing a great revolution for the good of the South and of the Nation," said Mr. Edmonds. "The growers of early vegetables and citrus fruits are beginning to realize that they need a protective tariff against products grown with cheap labor of competing regions. There is developing through the South a demand by hundreds of thousands of farmers for an adequate tariff to safeguard the peanut, soya bean, tomato, fruit, and other industries."

Mr. Edmonds referred to the fact that workers in iron and steel mills in India receive 7 and 8 cents a day, and that heavy imports of cement and iron and steel from Europe means either a decrease in American wages or an increase in the tariff to protect the country against low wages of Europe, which are hardly more than one-fifth of those in America. He urged a duty on cement and higher duties on other articles which are not adequately protected. He declared that the broadest prosperity of the South can only be attained through a tariff to safeguard every industrial and



Robert F. Pack

ville; Florida—Leadley Ogden, Florida Travertine Corporation, Sarasota; Georgia—F. H. Abbott, editor "Georgia, Incorporated," Atlanta; Kentucky—C. J. Neekamp, secretary Northeast Kentucky

mineral resource, and agriculture as well. Mr. Edmonds declared that by reason of free trade or a low tariff many mineral resources in the South are not being developed. "The tariff is purely an economic measure," said Mr. Edmonds. "Let us get back to the spirit which, regardless of political parties, will enable the South to demand a protective tariff for all of its resources—mineral, industrial, and agricultural."

At the close of the morning session the delegates were entertained at luncheon by the American Mining Congress.

The afternoon session on March 15 was presided over by Dr. A. V. Henry, of Atlanta. Dr. W. F. Pond, state geologist of Tennessee, spoke on the relation of state geological surveys to all industries, and Harry F. Porter, industrial engineer of the Chamber of Commerce of Shreveport, La., on "Making Bricks Without Straw."

A. G. T. Moore, director of the cut-over land utilization section of the Southern Pine Association of New Orleans, discussed lumbering as the fore-runner of industrial progress. He spoke of the demand and supply of timber, the necessity of preserving and increasing forest areas, prevention of forest fires and modification of state systems and methods of taxing forest property. Discussing the cut-over land problem in the South, Mr. Moore recommended that these lands be utilized for farming and for production of livestock and animals for cloth production. Extension of Federal reclamation to the South was also urged. Mr. Moore stated that lumbermen had adopted selective cutting, improved methods of logging, the leaving of seed trees in the ground, the scattering of pine mast, nursery planting and transplanting, greater use of trees harvested, and development and manufacture of by-products from what otherwise would be sawmill waste, such as top logs into kraft paper, fibre board, masonite, etc. Mr. Moore stated that the public should have a sympathetic understanding of the problem of the lumberman, particularly in regard to the use of lower grades of lumber where practicable and in the matter of taxation and fire prevention. Mr. Moore stated that the lumberman makes available large areas of cleared lands without wasting timber and that there is an immense area of unused acreage of cut-over lands in the South suitable for agriculture or cattle raising. The lumber industry has established and colonized experimental farms and ranches. He stated that one company in Louisiana during normal operations cuts timber from 80 acres every 24 hours.

Mr. Moore stated that the acreage of idle cut-over lands is increasing to such an extent that the usual farm colonization efforts are inadequate to bring them

into use. "Private colonization based upon an exclusive farming plan has not and will not solve the problem of the South and of the country," said Mr. Moore. "Farming can not be depended



A. G. T. Moore

upon to develop these lands. The Federal reclamation program should be extended to the South and expanded to include animal husbandry."

Mr. J. K. Johnson, of Louisiana, presided over the evening session, March 15, and also spoke on reforestation in the South.

Tendencies in electric power development were discussed by Robert F. Pack, vice president and general manager of the Northern States Power Company and former president of the National Electric Light Association. He opposed "a form of government which will throttle individual initiative and endeavor," and favored a form "which serves, protects, and permits full liberty to personal and collective enterprise and which aids and encourages legitimate business." Mr. Pack declared that the Government should serve and protect its people and not oppress them. "We seem to be drifting from a serving and protecting government," he said. He declared that advocates of public ownership of electric light and power companies are conducting a piecemeal program leading to Government operation of this industry. He declared that the public ownership feature is "cleverly camouflaged" in pending bills in Congress for the Muscle Shoals, and Colorado, Columbia and St. Lawrence River projects. Mr. Pack stated that if the Government produces electric power on a large scale at these and other points, the next step will be for the Government to build steam plants

and distribution systems for the sale by it to electric consumers rather than through private companies. Mr. Pack declared that Government operation of a business is not right in principle and is of no direct benefit to the consumer.

Col. S. W. Wilkes, of the publicity department of the Atlanta and West Point Railroad, spoke on transportation in relation to industrial development and American progress.

Chairman R. G. Brown presided over the morning session March 16 when the new era of business management was discussed by Frank M. Surface, assistant director of the Bureau of Foreign and Domestic Commerce of the Department of Commerce.

Increases in factory efficiency were said by Mr. Surface to be due to advances by industrial engineers in production methods, improved labor-saving machinery, including the mechanical conveyor, progress in management, cost accounting, elimination of unnecessary sizes and varieties, the use of statistics as the basis of business judgment, and better cooperation between labor and management.

"Profitless prosperity" resulting from overproduction was discussed by Mr. Surface, who stated that it is discouraging to note that more than one-third of our business institutions fail to earn a profit even in the most prosperous years. "It is one of the wastes of business which ought to be overcome," he said. Mr. Surface stated that complaints of overproduction are due to the fact that new plants with more modern equipment and newer methods of management are able to lower the cost of production below that of older concerns. "For the new plant there is no problem of overproduction or overcapacity," said Mr. Surface. "Its products can be sold at the going price and show a profit, but the company with less modern equipment is unable to dispose of its products at these prices without sacrificing profits."

Mr. Surface stated that business should distinguish between obsolescence and depreciation, as obsolescence is like fire insurance, but depreciation is the wearing out of equipment and can be graded accurately and allowed by accounting methods. Pointing out that a modern plant may be rendered obsolete by a new invention, Mr. Surface stated that for those industries which are rapidly developing there is a need for obsolescence insurance which will enable manufacturers to keep abreast of the times. He stated that the Department of Commerce is considering an obsolescence survey in industry. "With proper engineering assistance, equipment could be given a percentage representing its efficiency, and it would be possible to determine a figure showing the relative

obsolescence of a factory and of an entire industry," stated Mr. Surface.

Mr. Surface advocated greater attention to developing adequate distribution methods. "There is no single manufactured product whose movement can be followed from the producer to the wholesaler or retailer," said Mr. Surface. "Such information as to purchases and stocks in the hands of dealers would be of great importance in guiding business judgment. A comprehensive national census of distribution is one of the urgent needs to furnish a foundation for the more accurate study of marketing and distribution." Mr. Surface stated that the matter of costs is being studied by the department in connection with distribution of products. While manufacturers know their costs, Mr. Surface stated that distributors do not know the details of their costs, covering warehousing, inventory, selling, delivery, etc. In order to reduce costs and eliminate wastes, it is necessary that distributors know these facts. Mr. Surface predicted important changes in methods of distribution in the near future.

Dr. Frank L. Hess, of the Bureau of Mines, described hydraulic operations in the production of phosphate rock in Florida. He stated that the bureau is conducting at its station in Alabama flotation experiments in removing the phosphorus from the rock with indications of practical results. Attempt is being made to secure an increased duty to protect the American industry from foreign imports. He stated that phosphate deposits in Idaho, Montana, Wyoming, and Utah are handicapped by the long freight haul to compete with the Florida product.

Road Commissioner Goode Montgomery, of Laurel, Miss., spoke of the necessity for a definite highway program in developing agricultural resources.

The afternoon of March 16 the delegates were the guests of the Mississippi Power Company on an automobile trip along the Mississippi Riviera, passing from Biloxi to Pass Christian and return.

At a dinner meeting at the Great Southern Hotel the evening of March 16, presided over by Dr. Payne, Rev. V. G. Clifford pronounced the invocation, and an address against Government operation of industries was made by J. G. Bradley, of Dundon, W. Va., president of the American Mining Congress and head of the Elk River Coal & Lumber Company.

"Business should not be restrained by legislative hobbles or bureaucratic commissions from which there is no appeal," declared Mr. Bradley. Mr. Bradley pointed out that present laws are not equipped to deal promptly and effectively

with errors in business. "The business transgressor should be promptly, speedily and severely punished," said Mr. Bradley. "The individual who does wrong should be convicted. Our liberties should be



Craig B. Hazlewood

maintained and the people allowed to continue to enjoy the rewards of honest business leadership and initiative." Recommendation was made by Mr. Bradley that legal procedure be reformed so that the responsible party can be dealt



Col. Sam W. Wilkes

with rather than to throttle business and prosperity.

Mr. Bradley pointed out that business has conformed to the expectations of communities and "has a place as a pro-

fession just as has the ministry, the bar, medicine, the army, the navy, and engineering." In stating that business is the most attractive of the professions, Mr. Bradley said it offers the largest opportunities for initiative and rewards. "Business is a composite of many industries and undertakings, large and small," said Mr. Bradley. "It comprises the banker, manufacturer, mine operator, lumberman, wholesaler, retailer, and agent. All of them support progress, efficiency, and thrift. They despise laziness, waste, and shiftlessness. Success is their goal, and failure their dread. There is solidarity in their attitude. Business must be kept going. Business has impressed the other professions and made them allies. It is the dominant social force from the Atlantic to the Pacific. We should see to it that business keeps its high standards, develops its civic consciousness, and continues its stand for honesty and fair play. Dereliction on the part of its leaders should be promptly punished. Business has allied itself with the economic fundamental forces."

Addresses were also made by R. G. Brown, of Louisville, Miss.; Attorney General Rush Knox, and State Senator Carl Marshall, of Bay St. Louis. Music was rendered by the W. Y. S. C. I. quartette.

L. J. Folse, of Mississippi, presided over the closing session, March 17, at which W. S. Bennet, of Chicago, spoke on taxation and industry.

Craig B. Hazlewood, vice president of the American Bankers Association and of the Union Trust Company of Chicago, discussed modern trends in industry from a banker's viewpoint. He stated that the formation of large industrial units has resulted in higher wages, diminishing costs, lower prices, more perfect market coverage, and a better balance between supply and demand.

"The South is forging to the front two, three, or four times as rapidly as any other section," said Mr. Hazlewood. "It has the greatest future of any section. It is an agricultural empire and a rapidly developing industrial empire. It is the future pulpwood and paper center of the continent. One-third of our foreign commerce passes through southern ports. Southern farms produce half of our commercial trucking crops. The South has more cotton spindles than New England. Its savings deposits have increased 800 percent, while those of the country as a whole have increased only 350 percent, and its individual bank deposits have increased 960 percent, while those of the country have advanced 580 percent."

Mr. Hazlewood stated that the South has two-thirds of 84 mineral products and leads the other states in 41 of these

products. The coal reserves of the South were said by Mr. Hazlewood to be double those of Europe, including Russia. The South produces one-third of the world's crude oil. He stated that the mineral resources of the South are accessible and well located with respect to joint use, water power, and transportation, and capable of economical year-round operation. "Mining has taken its place among the great essential industries," said Mr. Hazlewood. "Mining contributes one-fourth of our national income and one-half of the annual freight tonnage of railroads. In the raw material stage it pays direct taxes to the Government five times more than all other raw material industries together."

In stating that production and consumption in industries must be stabilized, Mr. Hazlewood quoted from a letter by President Coolidge to the American Mining Congress advocating cooperation in industrial development. Mr. Hazlewood declared that state and national governments should stop taxing the mining business into a state of overproduction. He pointed out that there is no comprehensive classification of lands and natural resources and that our system of taxation is archaic. Tax laws force owners of mineral lands to produce too soon and too rapidly, requiring the liquidation of assets in order to pay taxes and expenses, or the payment of taxes regardless of whether production is had. Mr. Hazlewood stated that the Standardization Division of the American Mining Congress has made important headway. Industries should think of maximum stability of operation and eliminate waste. He advocated studies and research to develop experience charts to determine probable consumption so that mine operators would have a scale on which to base their operations and consumers would have the benefit of prices closely figured to allow a fair profit on stabilized operation.

"The Government can not extend ownership, operation, or control to industries without sinking the ship of state," declared George H. Bailey, counsel of the American Mining Congress, of Washington, D. C., who was the last speaker.

In cataloging southern assets, Mr. Bailey referred to the necessity for organized development of southern resources. "While this industrial development is going on, see to it that the gates of individual opportunity are kept open," said Mr. Bailey. "Do not allow legislative shackles to be placed on individual effort or community cooperation. The Government never made a success of any business, and from the nature of its structure it never can succeed in business. Individual initiative is the greatest dynamic power in the country. In-

dustrial development may be paralyzed and destroyed by legislative restrictions, Government paternalism, or destructive taxation. The hope of profits has ever been the magnet to draw men to explore for ore, and the great mines of the country are the fulfillment of that hope, based on the guarantee of the Government that every citizen would be protected in what he found. Could the Government have prospected the country and developed our mines? Can you see Government control as opening or creating a mine? Take away the hope of profits and there will be no experimenting and no prospecting and our resources will be worked out and the industries decline. The only thing which Government control would do, besides to increase the cost of the products, would be to limit the profits of producers and wages of workers. Business is seeking rest from unequal taxation, and oppressive governmental and legislative interference."

Resolutions Adopted by the Conference

RECLAMATION

Resolved, That the general principle of reclamation is meritorious and that in equity the South should share in the Government's program for the future.

TOPOGRAPHIC MAPPING

WHEREAS the conflict between the different bills now before Congress dealing with the solution of the Mississippi flood problem is delaying the passage of an act leading to the control of these floods; and

WHEREAS H. R. 11142 has been introduced into Congress by Mr. Temple, of Pennsylvania, providing for the immediate starting of topographic mapping and stream gauging in the Mississippi Valley, necessary to the proper solution of the above problem and which is basic information needed in the work of control, no matter what scheme is adopted: Therefore be it

Resolved, That we urge the passage of said H. R. 11142, and copies of this resolution be sent to the Secretary of Commerce, Secretary of Interior, and the Senate and House committees to which said bill is referred.

GOVERNMENT OPERATION

WHEREAS it has long been recognized that it is not a proper function of Government to undertake that which can be done more efficiently by private effort: Therefore be it

Resolved, That this conference records its opposition to Government ownership or operation of any line of business that can be more efficiently operated by private enterprise.

NATURAL RESOURCES

WHEREAS Dr. Henry Mace Payne has compiled and written a very useful, dependable book on "Natural Resources and National Problems," which is written in such language that it can be readily understood by the layman: Therefore be it

Resolved, That we recommend this book to all citizens interested in industrial resources, and especially those lawmakers charged with the solemn duty of safeguarding the development of our country.

LIFE AND WORK OF DR. SMITH

WHEREAS Dr. Eugene Allen Smith, for 54 years State Geologist of Alabama, who in point of years of service stood alone in the pioneer class by himself, and whose monumental services to his state and country can never be measured, has passed to the Great Beyond: Therefore be it

Resolved, That we mourn the passing of this great investigator, this faithful worker and this ripened scholar, whose intellectual integrity was unquestioned, whose energy was unquenchable and whose work will forever stand topmost among the ranks of pioneer geological workers; and be it further

Resolved, That we commend to the youth of our land a study and emulation of the sterling example of the life and work of Dr. Smith, whose place as a teacher, gentleman, and geologist stands supreme in our hearts.

GEOLOGICAL SURVEYS

WHEREAS it is recognized that one of the greatest perpetual sources of wealth in the South lies in its mineral resources, and the several state geological surveys now in operation constitute the logical and most important public agencies for investigation of and dissemination of information on these natural resources; and

WHEREAS through lack of adequate appropriations these surveys are hampered, not only in the publication of the results of their labors but also in the prosecution of active research in connection with the mineral resources of the South; and

WHEREAS the state of Louisiana has no geological survey in operation; and

WHEREAS miners, manufacturers, and particularly all lines of business depend greatly for accurate information in regard to natural resources on research and publication facilities provided by such state surveys; and

WHEREAS state and Federal and private geological research, reclamation work, lumbering and reforestation, agriculture, flood control, industrial waste disposal, solution of stream pollution problems, highways, railroads, pipe lines, power lines, and industrial site location surveys, mineral water, and sewage problems, and in fact practically every type of engineering endeavor is vitally affected by topographic conditions; and

WHEREAS available information on the topography of our Southern States is so inadequate as to constitute an obstacle in the path of orderly industrial development in the South: Therefore be it

Resolved, That we memorialize and urge the legislatures of those states operating geological surveys to make sufficient appropriations for the maintenance of adequate geological research and the publication of geological data; and be it further

Resolved, That this conference memorialize the Governor-elect and the legislature of the state of Louisiana, urging the reestablishment of its state geological survey under capable direction and with funds sufficient to accomplish its purpose; and be it further

Resolved, That this conference respectfully urge the proper Federal and state authorities to take whatever steps may be necessary to secure the early completion and publication of topographic maps covering these Southern States.

(Continued on page 287)

HEARINGS BEFORE SENATE INTERSTATE COMMERCE COMMITTEE ON COAL INDUSTRY

Investigation Of Conditions In Bituminous Coal Industry Well Under Way—Testimony Interesting And Varied—Story Of Hearings Briefly Presented

THE Senate Committee on Interstate Commerce has been busily engaged in conducting the hearings before it on conditions in the bituminous coal industry. Each day the committee room is crowded to capacity with members of Congress, coal operators, labor leaders, newspaper men, feature writers and interested spectators. The testimony has been presented by members of all strata of society from the humble miner to Charles M. Schwab and John D. Rockefeller; from representatives of the labor union to priests and clergy; from newspaper reporters to renowned novelists like Fannie Hurst. A short review of what has taken place up to the time we go to press (March 26) follows:

Early in the investigation the subcommittee which made the investigation of conditions in the bituminous coal industry in the Pittsburgh district, composed of Senators Gooding, Wheeler, Pine and Wagner, submitted a report. It recommended that legislation be developed to put the coal industry on a reasonably prosperous basis.

The report states that conditions in the Pittsburgh district and other coal fields are serious and dangerous to the best interests of the country. It criticizes the activities of coal and iron police and deputy sheriffs. The subcommittee states that it was impressed with the courage and determination of the miners for what they believed is their due—an American wage making possible an American standard of living. The report states that as the miners' union had asked for the investigation, the subcommittee had asked Vice President Murray, of the union, to prepare the schedule for its trip of inspection. The report is largely devoted to a discussion of conditions of living surrounding the striking miners.

JOHN L. LEWIS FIRST WITNESS

John L. Lewis, president of the miners' union, was the first witness before the committee on March 7, with a 30-page statement attacking operators for failure to observe the union wage agreement and railroads for depressing coal prices. Senator Couzens (Rep., Mich.) developed the fact that the union contract bound the companies by implication and not by specific terms to employ union labor exclusively. When asked why the union had not taken court action to compel compliance with the contract, Mr. Lewis stated that there was doubt as to whether action could now be taken, in view of the fact that the contract had expired a year ago, and also because of inability of the union, which is not incorporated, to file bond to guarantee losses which the companies might sustain in a suit enjoining them from operating on other than the union terms. Mr. Lewis read hitherto unpublished correspondence between himself and President Coolidge over the union contract. It showed that on November 21, 1925, Mr. Lewis called the President's attention to violation of the wage agreement by the Pittsburgh Coal

Company, Consolidation Coal Company, Bethlehem Mines Corporation, and the coal interests of the Buffalo, Rochester and Pittsburgh Railroad, which Mr. Lewis said were responsible for present conditions. These and other companies were said by Mr. Lewis to "have utilized coercive and oppressive methods," and that their acts were "savage and dishonest." Their actions were alleged to have added to the burden of "those honest operators who desire to operate" under their agreements. Mr. Lewis stated that operators and miners had felt the influence of the Government when it had intervened in the coal industry and had regulated their policies accordingly. He asked the President if the Government would intervene to maintain the agreement, and if not, would the miners be considered as justified in efforts in that direction.

The President's reply stated that Government officials had helped to bring about a meeting of the operators and the union in 1924 in the hope of preserving peace in the industry and preventing waste to the country. The President further stated: "The Government took no part in the discussion at Jacksonville, and can in no sense be considered a party to the contract." The President stated that certain companies had subsequently asked the Government to secure a downward revision of the contract, but that the officials had declined on the ground that alterations must be by mutual agreement between the parties involved. The President stated that injured parties could appeal to the courts if contracts had been violated. "The Government, not being a party to contracts, has no status in enforcement," said the President. "If no enforcement is found by appeal to the courts in labor contracts, law-making powers should enact measures to enable the courts to give relief. The courts have had few, if any, opportunities to pass upon the legal right of enforcement of industrial joint wage agreements because they are generally performed as a joint obligation without violation." The President stated that Mr. Lewis would perform a public service by getting a court decision on this subject. The President further stated that a great majority of mines had maintained the wage agreement, although a majority of these lost money for some time due to competition of non-union fields paying lower wages.

Mr. Lewis declared that during the war operators had reinvested their earnings in new mines rather than to meet Government tax exactions. He referred to the union as a stabilizing force in the industry, claiming that it had stabilized production costs and minimized internal

cut-throat competition. He charged that operators in the Kanawha, W. Va., and the western Kentucky districts, began pirating coal production on an un-American wage basis, and that in Pennsylvania and Ohio, where wages have been reduced from 30 to 60 percent, coal is sold without profit by operators. He stated that a larger proportion of coal operators are now in bankruptcy than at any other time, and that non-union mines are operating with inefficient labor. Another charge was that in every wage conference railroads worked to block the progress of the miner. He quoted Secretary of Labor Davis in an address before the American Mining Congress Convention in 1925 as criticizing abuses of railroads in coal buying and the National Coal Association as criticizing in 1927 the policy of purchasing agents of railroads in reducing coal prices.

Recommendations by Mr. Lewis to meet the situation were as follows: Forbid injunctions by courts in labor disputes, or allow access by the union to the labor force of operators to solicit their affiliation with the union; amendment of the commerce act to prevent railroads from depressing wages and destroying the union; consolidation of operating units in the industry; economies in mining through mechanization; elimination of pyramid profits; increase of safeguards to the miner by rationalization of mining; conservation of coal now wasted in the struggle to put the easiest produced coal on the market; fair wages for miners and fair profits for operators through organization of the industry in harmony with modern business.

Mr. Lewis declared the bituminous industry to be incapable of monopolization. He declared that there are many communities in non-union fields in West Virginia and other states in which representatives of the union are not allowed to enter and where miners are denied the right of assemblage. He asked that the Departments of Justice and Labor be authorized to preserve constitutional rights in these places. Another charge was that post offices in unincorporated non-union coal camps are operated by agents of coal companies, who prevent the union from using the mails in communicating with miners, and that free access to these post offices is denied members of the union. He declared the system of coal and iron police is fundamentally wrong and that it has resulted in the use of Government power by private corporations in non-union fields. He made a general condemnation of non-union operations and conditions in non-union fields.

Mr. Lewis declared that uneconomic mines must be closed, unscientific freight rates abolished, strife and conflict give way to peaceful labor relations and that the Constitution and laws be preserved in every coal field. Mr. Lewis stated that previous awards of Government commissions had become the basis of the last wage agreement.

Senator Couzens asked for a definition

of stabilization of the industry, which was given by Mr. Lewis as placing it in order, eliminating mines whose excessive costs are borne by the public, and to reduce the intermittency of employment.

"Have you in mind stabilization of price?" asked Senator Couzens.

"No, but stabilization of the industry will bring about stabilization of price," said Mr. Lewis.

In reply to Senator Wagner (Dem., N. Y.), Mr. Lewis said the last union agreement would not have been made unless the Government had aided. Mr. Lewis stated that American coal mines are the most efficient in the world due to the work of engineers and the use of machinery. He referred to the heavy cost of safety in mining operations, citing expenses for timbering, rock dusting, ventilation, and mine inspection. He stated, however, that because of competitive conditions in the industry there is a pressure to save money at the expense of safety measures. He stated that state mine departments had said that in a number of cases operators were unable to install safety equipment due to competitive conditions as it increased the cost of operation.

Mr. Lewis stated that various railroads had reduced prices for coal purchased by them from 79 cents to \$1.55 per ton from 1923 to 1927. He said that while the leading coal companies were decreasing wages, the U. S. Steel Corporation is paying the union wage agreement at its mines. Asked by Senator Gooding whether American mining methods are economical, Mr. Lewis stated that they are very wasteful. Asked by Senator Fess (Rep., Ohio), whether unorganized labor could produce all the coal the country required, Mr. Lewis stated that it could be done if the union was eliminated, but that it would reduce wages to an undesirably low level.

Senator Wheeler asked for the motive of the Pittsburgh Coal Company in breaking the union contract. Mr. Lewis stated that in conversation with Mr. Warden he had gathered that the purpose was for the new officials of the company, who had replaced former officers, to make a record for the company as it had had a bad year in 1924. Mr. Lewis charged that the company had spent money in its new policy against the union out of all proportion to what the cost of the company would have been had they continued to operate under the contract. He stated that under reduced freight rates to the lakes the company could pay the union scale at a profit notwithstanding lower wages in southern mines. Asked by Senator Wheeler as to charges that the union had not observed wage agreements, Mr. Lewis said there had been local breaches of contract and strikes. Mr. Lewis stated that anthracite miners resented the treatment of bituminous operators against the union and would like to join them in their struggle, but the union had advised them to keep their agreement.

Senator Watson asked how legislation could remedy a situation where there are too many mines and too many miners. Mr. Lewis said that Congress could amend the anti-trust laws so as to permit large consolidations in the industry, or make some expression which would abolish fears of operators toward consolidations.

Addressing operators in attendance, Mr. Lewis said: "You'll deal with the

union now, or in the end you'll deal with the I. W. W. and others of that stamp."

Senator Wagner (Dem., N. Y.), questioned C. E. Leshner, vice president of the Pittsburgh Coal Company, as to the differences between the price of \$2 per ton for coal to railroads and \$5.50 to consumers in Pittsburgh. Mr. Leshner stated that railroad coal was run-of-mine and the local coal was the lump product costing \$2.75 at the mines, plus delivery charges. Mr. Leshner stated that 61 mines of the company had been closed in two years, and that 19 are now operating with a production of 700,000 tons per month. The company had formerly shipped coal as far south as New Orleans and as far west as Iowa, but its tonnage had declined from a maximum of 23,000,000 tons in 1913 to 8,000,000 tons in 1924.

In concluding his testimony, Mr. Leshner denied that the Pittsburgh Coal Company is trying to destroy the union. Asked by Senator Wheeler why the company put advertisements in papers as to the company's policies, Mr. Leshner stated that it is the only way the company can place its version of the situation before the public.

At the session March 9, F. E. Herriman, president of the Clearfield Bituminous Coal Corporation, subsidiary of the New York Central Railroad, denied that that road dominated the coal situation in the Clearfield district, and refused to criticize companies which had declined to continue the union wage scale. He defended the right of companies to employ deputy sheriffs to protect their property, as it had long been a practice in times of disturbances. The deputies employed by his company had been supplied with protective weapons, but not with tear-gas bombs. He denied statements of John L. Lewis as to wasteful mining, stating that his company recovered 80 to 90 percent of the coal. Mr. Herriman stated that he believed in collective bargaining, when the companies could deal with men to meet economic conditions, but objected to collective dictation to which the companies had been subjected by the union. He contended that wage agreements should be based on conditions in the individual districts without regard to conditions in other districts. He asserted that the union will not arbitrate or compromise. Senator Wheeler upheld negotiations by the union on the ground that railroads had agreed to legislation for adjustment of disputes, which had been endorsed by railroad workers. Mr. Herriman declared that his company paid a living wage and that the men working in the mines were not represented at this hearing. Mr. Herriman said his company operated under the union scale for three months after its expiration last April. When Senator Gooding suggested that under the union scale the miners work steadier, Mr. Herriman declared the facts proved the opposite.

W. G. Warden, chairman of the board of directors of the Pittsburgh Coal Company denied that he became chairman of the board in order to make a record. His purpose was to see if the financial condition of the company could not be improved because 1924 had not been as good a year as 1923, on account of the low price of coal. He had decided that the labor policy must be revised. The entire board subscribed to the new policy of operating on an open-shop basis.

"When did you break the union contract?" asked Senator Wheeler.

"We did not break the contract," said Mr. Warden, who explained that the company decided in 1925 to close the mines as they were operating at a loss of 10 cents per ton, due to decreased production. The company bought coal from others when its mines were closed to meet contracts for the northwest. He denied that his company had evicted miners from their homes. The company had offered to move the men without cost to other houses of the company which were unoccupied.

Mr. Warden stated that he did not believe in collective bargaining, but preferred to deal directly with the miners. Companies should have control over their own men, he said, and not be dictated to by labor organizations. He declared that his company had always endeavored to make such improvements as would permit the miners to produce more coal as cheaply as possible and earn more money. The high cost mines, he believed, would eventually be eliminated. He said that selling agencies would be desirable if carried out on the proper basis.

Rembrandt Peale, president of Peale, Peacock & Kerr, operators in Central Pennsylvania, declared that he preferred dealing with the union if competitive conditions could be maintained. He stated that he believed there was a need for more cooperation in the coal-mining industry, not only in the mining, but in the distribution and selling ends.

Thomas Sagel, of the Roseville, Ohio, Coal Company, testified, March 12, that the purchasing agent of the Pennsylvania Railroad, a Mr. Owens, had told him in conference at Chicago in April, 1927, that the railroad would not pay prices for coal which would justify the union wage agreement.

Testimony was given by Chester Penrod, of the Robinson Coal Company of Crooksville, Ohio, to the effect that Purchasing Agent Owens had given an oral order in April, 1927, for coal for the Pennsylvania Railroad at \$1.90 per ton, but had cancelled the order the following day by telephone on the basis of advice from the Philadelphia office that the railroad would not purchase from union mines. C. D. Heisman, attorney for the Pennsylvania Railroad, said the mines of the company had not been closed because of cancellation of this order, but on account of the miners having gone on suspension April 1. Mr. Heisman also stated that Purchasing Agent Owens would have communicated with the Pittsburgh office and not with Philadelphia. It also developed that the witness had been a member of the union before becoming an official of the coal company. Answering Senator Watson, the witness stated that his company could operate under the union scale if it secured \$2.25 per ton for its coal.

Frank J. Bender, of Zanesville, secretary of a district mine union, stated that notwithstanding the fact that the Pennsylvania Railroad had a coal station in the Coshocton district, it was buying coal from non-union mines elsewhere. An attorney for the Ohio Coal Operators' Association stated that 21 companies owned by six operators had a loss in 1924 under the union agreement, and that their production had been cut in half from 1924 to 1925. Mr. Bender stated that when the union suggested that a commission be appointed representing the operators and miners to examine the books of the companies as to their losses, that the operators refused.

Charges of the union that operators and railroads were in agreement to depress coal prices and wages were denied by R. L. Wildermuth, of the Lorain Coal and Dock Co., of Columbus, Ohio, and John W. Searles, of the Pennsylvania Coal and Coke Co. Mr. Wildermuth said other industrial consumers paid more attention to getting lower prices than did the railroads. He defended the use of armed guards and deputies by coal companies to protect their properties.

Consolidation of coal-mining companies into larger units and establishment of centralized cooperative marketing agencies were recommended for stabilization of the coal industry before the committee by S. H. Robbins, of Cleveland, president of the Ohio Coal Operators' Association, at the March 13 session. Mr. Robbins stated that the consolidation of operating companies would assure more efficient management, operation and control, and the cooperative marketing agencies would stabilize prices and abolish unfair marketing practices. Mr. Robbins stated that Kentucky and West Virginia are now the principal competitors of Ohio coal and that Ohio operators consider it necessary to operate on an open-shop basis. He stated that Ohio coal has been largely eliminated from Ohio and other markets because of the arbitrary position of the union with reference to wages, and denial to Ohio, through inequitable freight rates, of the advantages of its geographical location. He declared that the union refused to recognize economic and competitive conditions and that its officers have become more arrogant and difficult to deal with. He declared that the union had eliminated arbitration from its constitution and entered wage conferences with demands which if not granted result in disruption of negotiations. Mr. Robbins stated that representatives of Ohio operators signed the union agreement in 1924 with many misgivings as to its workability. Mr. Robbins recounted numerous attempts of Ohio operators to get the union to agree to modification of the wage agreement on a continuous competitive basis, but without success, as the union refused to consider any proposals contemplating reduction of the union scale. Mr. Robbins stated that a new wage scale drafted by Ohio operators but rejected by the union provided for as high wages as those paid in other industries in Ohio for similar work.

Mr. Robbins defended the injunction issued by Judge Hough, of the southern district of Ohio, restraining the union from interfering with operation of mines on an open-shop basis, on the ground that it was necessary to protect the property of the companies and the lives of the miners. This injunction was scored by Attorney Warmuth for the union, and by Senator Wheeler (Dem., Mont.), who declared that it was issued for the purpose of enforcing what they termed to be a "yellow-dog" contract. Senator Wheeler stated that the mining companies had a right to close their mines, but that operators signing the union wage agreement were legally and morally bound to carry it out. Senator Wheeler criticized Mr. Robbins for refusal to attend the conference called last December by Secretary of Labor Davis. "The operators were unwarranted in refusing to attend the conference," said the Senator. The Senator said the public had not received reduced prices on their coal as a result of operation of mines under wages lower than

the union scale. The Senator stated that the operators and miners look at the controversy from their financial standpoint, while the public views it from the economic, moral, and human standpoints. Mr. Robbins defended the refusal of operators to attend conferences called by Secretary Davis and the Governor of Ohio, on the ground that they would be futile, as the union would not arbitrate, but insisted on an agreement involving no reduction from the union scale. Asked by Senator Wheeler what Ohio coal operators had done to relieve conditions prevailing among families of the miners, Mr. Robbins stated that they had offered the men work, which would enable them to care for their families. Senators Wheeler and Gooding said that for the miners to work other than under a union contract would require them to leave the union. In reply to Senator Gooding, Mr. Robbins stated that the operators had not refused to be bound by arbitration. The witness read into the record considerable correspondence between the association showing fruitless attempts to negotiate an agreement with the union other than on the union scale, conferences being held at Chicago, Cleveland and Toledo, with John L. Lewis, of the miners' union, and Lee Hall, of the Ohio union.

The New York Central Railroad, through W. C. Bower, manager of purchases, denied union charges that it depressed coal prices in order to destroy the union. Asked by Senators for legislative remedies for the coal situation, Mr. Bower suggested a commission on the order of the Interstate Commerce Commission to supervise consolidation of mining companies and selling agencies.

"The price of coal is determined by supply and demand," said Mr. Bower. He stated that under the transportation act an excessive price paid by a railroad to a shipper from whom it would purchase supplies would be an unlawful rebate. As railroads must operate economically, they are not permitted to pay in excess of market prices. He had no agreement or understanding with other railroads as to prices to be paid for coal, or the localities or class of operators from which it should be purchased. He stated that neither he nor the New York Central system is or has been engaged in any conspiracy with other roads to exert bargaining power to depress fuel prices or to favor non-union operators or miners.

Under questioning, Mr. Bower said his railroad buys both union and non-union coal and is now buying union coal in Illinois and Indiana.

A get-together conference to discuss legislation was urged March 14 to the committee by John H. Jones, president of the Bertha-Consumers Co., Pittsburgh, now in the hands of a receiver.

Declaring that chaos would result if wage scales were broken down, Mr. Jones said he favored the creation of a body like the Interstate Commerce Commission, to be composed of representatives from the miners, operators and the public. He declared that he preferred to work with the unions instead of against them and that such a commission should make it impossible to have "such horrible conditions" as have been experienced in the last year or so.

Mr. Jones said that, in matters of collective bargaining, the questions involved "should be referred to this commission and its decisions made final." He criti-

cized competition between operators themselves, saying all could get more for their coal if they worked together.

"I think the operators are their own worst enemies," declared Mr. Jones, adding that if some way could be found to eliminate the strikes or stoppages of work "the consumer would not pay any more or as much for his coal as in the past."

"Many coal companies can't last under present conditions," Mr. Jones testified. "Taken as a whole, we are going to see more shipwrecks this year than ever before," he predicted.

OFFERED MINE TO WORKERS

He did not agree with Mr. Lewis, he continued, in his declaration that the railroads had been unfair.

The witness told Senator Wheeler he would rather have collective bargaining than the kind he had experienced in the last year or so, and he declared he had offered to turn over his mine to the miners and let them pay 4 percent of the investment.

Mr. Jones favored a six-hour day and a five-day week "at the face of the works."

Mr. Jones then proposed that the committee subpoena operators and miners to a conference, with the idea that the conference will prevent strikes.

W. R. Woodford, of Cleveland, president of the Rail and River Coal Company, operating mines in Ohio, owned by the Canadian National Railways, called and questioned by the union, said the mines of the company were idle as the railroad is able to secure coal in West Virginia for 45 cents per ton less than it could be furnished by its mines in Ohio. Attorney O. K. Eaton, for the union, sought to prove that the Canadian government is a party to the attack upon the union in this country by seeking to reduce wages of American miners. Mr. Woodford testified that the company had operated on a union basis until April 1 last, but that he had had no conversation with or orders from the railroad regarding wage reductions or transfer to a non-union basis. Mr. Eaton sought to show that because of the extra freight charges on West Virginia coal and the cost of keeping its Ohio mines idle the Canadian railroad was paying more than it would if it operated its mines on a union basis. The Canadian railroad owns 30,000 acres of coal land in Ohio, and its mines formerly employed 1,500 men in producing 1,400,000 tons of coal for its operation. Asked by Senator Fess for a solution of the situation, Mr. Woodford advocated enforced arbitration of wage disputes. He thought the Ohio situation would have been saved had the union agreed to a wage reduction. Senator Couzens (Rep., Mich.), said the situation could not be handled from the standpoint of any one district, as relief for that district would transfer the situation to another district. Mr. Woodford quoted C. J. Alvasin, commissioner for the Eastern Ohio Coal Operators' Association, to the effect that 6,000 miners had left that section for southern mines. Mr. Woodford stated that some miners who lived in Ohio worked in West Virginia mines. Referring to conferences of operators with the union, Mr. Woodford quoted John L. Lewis of the union as saying that there would have to be some suffering by a few for the good of the many. Mr. Lewis said that if wages were reduced in Ohio, they would have to be reduced in other states, and had

declined to agree to any modification of the wage scale.

Attorney Rose, of the Pittsburgh Coal Company, declared before the committee that the letter read by Henry Brundidge, St. Louis reporter, purporting to give instructions to superintendents of mines, to clean up preparatory to the recent visit of the Senate subcommittee, had not been issued by the company and was a forgery. He asked that Mr. Brundidge be required to give the name of the party from whom he purchased the paper for \$25 and that Rev. Gilbert Nowell, pastor of a Methodist church at Houston, Pa., who had stated that an official of the company had told him that he had received the letter be required to name the person giving this information. Both witnesses had declined previously to name their informants. Senator Fess (Rep., Ohio), said the names should be given, and Senator Watson (Rep., Ind.), chairman of the committee, said the matter would be considered in executive session. Attorney Eaton for the union read a letter from J. D. A. Morrow, of the Pittsburgh Coal Company, to employees dated February 20 advising them of the committee visit and the desire of the company to show the Senators how the mines are operated. "That has no reference to cleaning up," said Senator Watson. Attorney Rose said that letter had been issued by Mr. Morrow and the company was not ashamed of it.

Van A. Bittner, organizer for the miners' union, testified as to the action of coal companies in northern West Virginia in breaking agreements made with the union at Baltimore and New York. He referred to the "union wrecking campaign" and classed the breaking of the agreement as criminal. He stated that northern West Virginia operators go further than Pittsburgh operators in justifying their action. He stated that the West Virginia agreements took into consideration freight differentials by making the rate \$7.26 per day. Non-union mines in this district are paying \$4.60 per day.

CHARLES H. SCHWAB TESTIFIES

Mutual understanding between employers and employees based on the company representation system and unhampered by outside influences was given as the only solution for difficulties in the coal industry by Charles M. Schwab, of the Bethlehem Steel Company, before the committee on March 23. Mr. Schwab outlined this labor policy which he had developed and which he stated had prevented a strike in his employment relations for the past 45 years. Mr. Schwab did not believe legislation would help the coal situation, although he said consolidations of coal companies could be authorized as larger units can do business more successfully than smaller organizations. He said the present sensational investigation is doing more harm than good. When Senator Gooding (Rep., Idaho), referred to unsatisfactory conditions in one of the mines of the Bethlehem Mines Corporation, Mr. Schwab reminded the Senator that he perhaps could not himself control the actions of the members of his household, and that the Senate had difficulties. When Attorney Eaton for the union asked Mr. Schwab if he did not know of certain conditions in mines of the company in Pennsylvania and West Virginia, Mr. Schwab asked if the attorney knew all of the principles of law. Mr. Schwab stated that he would investigate the

mines of the company about which complaint had been made.

Mr. Schwab declared that creation of artificial conditions in reference to labor in industry is unsound. He favored modification of collective bargaining by which conditions of labor are discussed and settled by the management, with delegates elected by the workers. In his company each 300 men elect such a representative. In 10,000 cases the question at issue between the company and the men has been settled without arbitration. The men are taken in complete confidence of the company, and are given the same report of costs and earnings as are the stockholders. His company has made more wage advances than wage reductions. The average hourly earnings of employees is now 63 cents. Mr. Schwab declared that human engineering is more important than mechanical engineering. The steel workers of the company own \$37,000,000 worth of its stock and the workers in the mines of the company own \$3,000,000 of its stock.

Mr. Schwab stated that because of difficulties in the coal situation the company would be glad to retire from the mining business. Senator Gooding did not think the coal industry could be compared with the steel industry, but Mr. Schwab said there is no great difference between the two, and they should be managed alike. Mr. Schwab did not admit, when asked by Senator Wheeler (Dem., Mont.), that the Bethlehem Mines Company had broken the union wage agreement. He suggested that the vice president of the company having charge of the mines give information on this question. "Our company keeps its agreements," said Mr. Schwab. "The company conducts its business on a high plane of business integrity."

Asked by Senator Wheeler if Mr. Schwab would meet with the committee, operators and miners to work out legislation, Mr. Schwab said that he would, but that he would not be a party to a conference that would embarrass him in carrying out his labor policy. Mr. Schwab did not agree with Senator Gooding that industries are over-developed, stating that the steel industry would advance in the future as it had in the past. Mr. Schwab stated that more labor goes into the coal industry than in the steel and manufacturing industries, and that the surplus miners should be diverted to other work.

Mr. Schwab stated that much of the trouble in industries has resulted from interference by the authorities at Washington, mentioning the fact that the Government had forbidden agreements in the steel industry as to where it shall sell its products and also as to the conduct of its business. He favored sane laws to permit business to be operated economically. Referring to the fact that during the war the Government had required railroads to use a central station in cities, Mr. Schwab said "Let us do the same in business." Senator Wheeler agreed to this theory, but said public interest must be protected. Mr. Schwab said steel companies had never made a fair return on their investments, but Senator Gooding did not think this to be true of the U. S. Steel Corporation. "The Government has never been successful in conducting business," said Mr. Schwab. "I agree with you," said Senator Wheeler. Senator Watson (Rep., Ind.), chairman of the committee, asked if the fear that the public would be plundered by big business, which prompted passage of the

anti-trust law, did not still exist. Mr. Schwab thought not. He stated that industrial economy is good for the country and pointed out that it costs more to distribute a product than to produce it. "We are seeking a remedy to cure manifest evils in the coal industry," said Senator Watson. "It is doubtful how the economic questions can be settled by legislation. Do you think the anti-trust law should be repealed to permit coal operators to fix prices?" "That is not the remedy," said Mr. Schwab. "The only solution is a mutual understanding between employer and employee." Mr. Schwab stated that President Lewis, of the miners' union, had made a mistake by not agreeing to wage reductions. "If the union persists in higher wages, there will be no more union mines," said Mr. Schwab.

John D. Rockefeller, Jr., a stockholder in the Consolidation Coal Company, but not officially connected therewith, appeared before the committee following Mr. Schwab, and declared that overproduction was the root of all evil in the coal industry.

The committee, said Mr. Rockefeller, should get together with the coal operators and solve the problem of overproduction. After that they should take up the question of freight rates and thrash it out with the railroads. Then the matter of distribution should be settled.

"If these three items on a program can be achieved," said Mr. Rockefeller, "you will have a strong economic foundation for the solution of the hardest problem of all—labor and wages."

Mr. Rockefeller explained that the Consolidation Company carried on under the Jacksonville agreement for a year after other companies had ceased to operate under it. When Senator Wheeler suggested that the company had abrogated the agreement, Mr. Rockefeller declared "The Consolidation Company did not abrogate the agreement. The Consolidation Coal Company continued to operate under the contract in spite of the fact that the loss which it was sustaining was increasingly heavy."

"The loss to the Consolidation Coal Company became so heavy that the officers felt that they could not continue to operate under the contract and that they must close down indefinitely the mines. Notice to that effect was given and the mines were closed."

"It then followed that while a number of the men living in the houses belonging to the company were working for other companies, there were still men in various communities where the company's mines were who had not worked for some time, or had little work, and they were anxious to go to work, and, as this correspondence reveals, requested the company to give them work on the basis of the wage scale that was then being used by a number of other companies."

"In other words, the situation having arisen that the two parties in whose interest the contract had been agreed to had in various ways indicated that the operation under the contract had ceased to be of their interest, the contract fell naturally."

"It seems to me," he said, "that this Senate committee, together with representatives of the bituminous coal operators, would be the first group that would be gotten together if I were having anything to do with attempting to solve the problem. And that the first question which those two interests would con-

sider would be the fundamental question of overproduction in the coal industry.

"The representatives of the operators and the Senate committee could reach some tentative program as to how this matter of overproduction might be dealt with. Then it seems to me the Senate committee and representatives of the operators would pass on the second question, namely, that of distribution, which also is a very vital question, a question of freight rates; and in the consideration of that highly technical question I should feel that they would naturally call in the representatives of the railroads which handle the coal business and that they together would seek to work out some tentative solution of the transportation problem.

"Now, after these groups, together with certain experts, had been able to come to a tentative agreement on these points, they would then have their basis of the economic structure, which in my judgment would give the best hope of their being able to deal constructively with perhaps the largest and most difficult of the problems of the coal industry, namely, labor and wages. In the consideration of that question the Senate committee and the operators would want to feel that the workers in the mines should be represented."

Mr. Rockefeller concluded by saying: "I believe that a spirit of cooperation is the only hope of solving the problems of industry, the problems of international life, the problems of civilization."

Richard B. Mellon told the committee he had been a director of the Pittsburgh Coal Company since 1921, succeeding his brother, Secretary Mellon, and that for two years prior to 1925 he had been chairman of the board. He and his brother, he said, owned 25 per cent of the capital stock of the company.

He declared he had voted for the resolution that reopened the mines, an action which he did not consider an abrogation of the Jacksonville agreement.

"You have no interest, then, in the human side of the mines and have not taken time to go out and see the conditions for yourself?" said Senator Wheeler.

"Oh, yes. I am interested in the human side of mines, but these matters were the concern of my associates who were actually in charge of the operation," replied Mr. Mellon.

"You do not show an interest, then, in the people from whom you get your money?" persisted Wheeler.

Mr. Mellon quickly responded: "You cannot accuse me of getting any money out of coal mines. There has been no money in the coal industry since the World War."

The miners' union was declared by George Anderson, of New York, vice president of the Consolidation Coal Company, to be conducting a war policy in the coal industry, at the March 26 session of the committee. He described John L. Lewis, head of the union, as a two-fisted fighting man, the Jack Dempsey of labor, who had been inspired by historic warriors. Lewis was declared to have the largest and best disciplined army in the labor movement, which he had conscripted, and which the witness said, was not a voluntary army. He declared that the check-off system unionizes the mine, but not the miners, and subjects the miner to mobilization overnight.

Mr. Anderson declared that the coal problem involves management, finances, labor, consumers, and the public, which had not been represented before the committee. In defending his company, Mr. Anderson stated that Van W. Bittner, of the union, who had attacked the operators in northern West Virginia, represented himself only, and those appointing him. Mr. Anderson resented the attack on the reputation of his company.

Illustrating the benefits to both miners and the industry from non-union operation, Mr. Anderson stated that production, miners employed, days worked, average earnings and total payroll in the Fairmont district had increased in 1927 over the record of 1924. Production increased from 3,360,000 tons to 5,590,000 tons; number of men employed from 4,180 to 4,500; time worked per man from 131 days to 256 days; average earnings per miner \$1,195 to \$1,517; total payroll from \$4,990,000 to \$6,825,000.

Mr. Anderson reviewed the strikes in both bituminous and anthracite which had been conducted by the union since 1919 and declared that the operators did not have a war policy. "Collective bargaining in the coal industry ceased 10 years ago," said Mr. Anderson. "The union is not run as a deliberative assembly, but as an army. The national strike is not employed in any other but the coal industry."

Mr. Anderson declared that the union had extended the bituminous strike in 1922 so as to include the anthracite industry, in which latter there was no common quarrel, attitude, or necessity involved. He quoted the late President Wilson as declaring the 1919 strike to be unlawful, and the late President Harding to the effect that the country, with the exception of non-union mines, to be at the mercy of the union. Mr. Anderson stated that the suffering in the present industrial conflict is not an argument, but is a fact. Mr. Anderson stated that the anthracite industry made desperate efforts to settle the strike in 1922, and could have settled it separately from the bituminous situation, but was prevented by union leaders. He stated that governors of states had reported that operators and miners in their districts had no dispute and that the miners were anxious to return to work, but were not permitted by union leaders. The union in the Fairmont district had tried to settle, but was prevented by the national union. Mr. Anderson stated that notwithstanding prices and wages in other industries had receded following the war, the mine wage was kept high by the leaders. He pointed out that at the Baltimore wage conference the union officers of the northern West Virginia district were not allowed to handle the wage negotiations. They were conducted by Percy Tetlow, of the Ohio union. Mr. Anderson declared that Tetlow was tied hand and foot by union leaders and was required to insist on the union demand for the \$7.50 wage scale. He quoted Mr. Bittner at the conference as saying that the union delegates were carrying out the policy of the national union in insisting on no reduction in wages. "There could be no agreement on that proposition," said Mr. Anderson. "There could only be concurrence in the union demand." In the face of constantly rising non-union production, operators had asked for a one-year agreement, which was refused. Only 21 of the 80 operators of the northern West Virginia dis-

trict ratified the Baltimore agreement. Mr. Anderson declared that representatives of the union in that district are controlled by the national union from the outside. He denied that his company had broken the agreement, declaring that the mines were closed, and that some of them have been closed for four years for lack of business.

Asked by Senator Fess (Rep., Ohio), for a solution to the situation, Mr. Anderson said he had no ideas, except that the Coal Commission had covered every phase of the situation. Senator Fess said that he could find no one who favors the recommendations of that commission. Mr. Anderson stated, in reply to a question as to whether the Baltimore wage agreement was binding, that collective agreements, which in this case were made by the operators association, are in a no-man's land of law.

Smarting under daily attacks on operators by John L. Lewis of the miners' union, W. P. Belden, attorney for Ohio operators, at the March 28 session said that statements of Lewis were "misleading and false, presenting a distorted view of the situation." He asked that Ohio operators be allowed to testify in refutation of his charges and that they not be allowed to be maligned without opportunity of answering. Mr. Belden was prompted by a declaration of Mr. Lewis that operators have adopted a Dr. Jekyll and Mr. Hyde labor policy, which he said consisted of operators in Ohio and Illinois beating down prices and wages in Kentucky and refusing the union demand for higher wages in their home states. "That is one of the reasons for the disorganization in the industry," said Mr. Lewis. Mr. Lewis stated that Ohio operators had invested in West Virginia mines and in negotiations for the wage agreement in their Ohio mines referred to competition in West Virginia as a basis for lower wages. He stated that the Illinois Central Railroad had assisted the Madison Coal Corporation which he declared was its subsidiary, in making the Western Kentucky district non-union in 1924, and that Illinois operators then argued for lower wages in Illinois to meet Kentucky competition.

Outlining legislation for relief of the coal situation, Percy Tetlow, of the United Mine Workers, recommended that the right of collective bargaining be recognized; that labor be relieved from court injunctions; that the industry be allowed to make consolidations and create sales organizations, and that a government board be created to assist in working out methods of mining to conserve fuel, prevent waste, and promote the safety of the miners and to regulate the selling price of coal so as to equalize it among all consumers. Mr. Tetlow stated that some consumers are able to buy coal at unreasonably low rates, while others are forced to pay higher charges. He declared that under present mining methods 250,000,000 tons of coal are annually lost through waste.

Former Senator A. O. Stanley (Dem., Ky.), attorney for operators of Kentucky, Tennessee, Virginia, and West Virginia, declared that there is a distinction between Government ownership and regulation, and of nationalization or socialization of industry, and Mr. Tetlow admitted that under his plan it would mean the socialization of the coal industry.

NEWS OF THE MINING FIELD



Production Started at Plant of Domestic Manganese & Development Co.

Production of ore at the largest and most modern manganese nodularizing works in the world, started on March 15, at the plant of the Domestic Manganese & Development Co., at Butte, Mont.

The plant consists of two rotary kilns, 125 feet by 8 feet, with other latest improved accessories and equipment. The plant represents an investment of \$500,000 and is used in roasting the rhodochrosite ores of Montana. Ores will be drawn from the Emma mine of the Anaconda Copper Mining Co., the Travonia mine of the Clark Montana Realty Co., and other properties of the Butte, Philipsburg and Basin districts of Montana. These districts have sufficient ore already determined to supply the plant for an indefinite period.

Reserves of manganese ore in the districts have been estimated to run into the millions of tons. The production of the plant is rated at 100,000 tons per year of ore running 57 percent metallic manganese. This is higher grade ore than any ores ever shipped from foreign countries. This plant will be a big factor in bringing domestic production to a point where the United States will be independent of the uncertain foreign supply of manganese ore.

A. S. & R. Establishes Mining and Geological Department

The Utah division of the American Smelting & Refining Co. has started the enlargement of its operating scope with the addition of a mining and geological department with headquarters in Salt Lake City.

A. H. Means, geologist of international repute, will head the new department. Mr. Means has had experience in Mexico, British Columbia, South and Central America, and Newfoundland.

The new department has been established with the object of giving closer cooperation to mine owners of the intermountain section and to aid in solving problems that may arise, according to Mr. Means.

Later in the year A. E. Ring, at present manager of the Rawley mine at Bonanza, Colo., will join the geological staff. Mr. Ring is an engineer with many years of experience as operator and geologist.

Howard Young Made Director and Vice President of American Zinc Co.

Howard I. Young, general manager of the American Zinc Co., at Mascot, Tenn., has been elected a director of the parent company, the American Zinc, Lead and Smelting Co., and made vice president in charge of all operations of that company's and all its subsidiaries.

Through subsidiary companies in various states, in which the parent company owns all the stock, it operates mines, smelters, and an oxide plant. The principal mines of the company are in Tennessee, Missouri, Oklahoma and Montana. It also has mines in Arkansas and Wisconsin. It has smelting plants in East St. Louis and Hillsboro, Ill. It has an oxide plant at Columbus, Ohio, to which the zinc mined at Mascot is shipped and used in the making of oxide for paint and automobile tires.

It is understood that Mr. Young's greatly enlarged sphere of activities will take him into many states. He will continue to make his home at Mascot.

L. H. McColgin has been made manager of the ore-buying department of the American Zinc- Lead and Smelting Company, to succeed R. E. Brown, who has resigned.

Mr. Brown, who has been acting as manager of the ore-purchasing department of the company during the illness of C. W. Westcott, has resigned, effective March 26.

Shattuck-Denn Plans Further Development Work

The Shattuck-Denn Mining Corporation, Bisbee, Ariz., has decided on further extensive development work which it is estimated will mean the expenditure of more than \$100,000 for new equipment in the near future, and will extend the main shaft 100 feet or more. An electric hoist capable of hoisting directly from the 2,000 level is included in the equipment to be purchased, although it will be some time before the installation. These plans are announced by Thomas Dardon, of New York, director of the company, who has been spending some time in the Bisbee District. T. O. McGrath is general manager of Shattuck-Denn.

Northwest Mining Association Holds Big Meeting at Spokane

Spokane, Wash., was again the host for the annual convention of the Northwest Mining Association, which was held in that city the week of February 27 to March 3. More than 500 visiting mining men, prospectors and claim owners attended, and from all reports this meeting, the thirty-third annual one of the organization, will be long remembered. The ore exhibit, containing specimens from 1,053 properties in the various northwest districts, was especially interesting and more extensive than ever before.

There were eight general sessions held with several interesting addresses and papers presented at each one. Among the speakers were: Chas. H. Goodsell, president of the association; Governor Hartley, of Washington, E. J. Barnes, state director of conservation and development; V. H. Greisser, of Spokane; H. C. Henderson and O. I. Deschon, Great Falls; Governor Erickson, of Montana; Dr. C. E. Newton, Oregon State College; Chas. D. Garfield, Seattle; D. A. Callahan, Wallace; L. O. Howard, Pullman; Dr. Milnor Roberts, Seattle; and G. B. Conway, Helena.

The following are among the resolutions which were unanimously passed:

Urging the revision of the Federal tax law by adoption of a percentage of income basis for computing depletion deductions for metal mines; Favoring increased support in the way of funds for the field stations of the Bureau of mines; For the abolition of the stamp tax on stock certificates; Condemning an amendment to the revenue law which would make subject to tax corporation dividends distributed from earnings made prior to March 1, 1913; Endorsing bills before Congress by which the Columbia River Basin irrigation project would be brought into a productive state. Other resolutions had to do principally with highway improvement projects and the passing of several prominent members.

The association took steps to secure the Western Division meeting of the American Mining Congress for Spokane in 1929, pointing out that for several years there has been no general western meeting of The Mining Congress in the Northwest and that the increasing interest in mining in that section would warrant holding one there.

Lake Superior Section, National Safety Council, to Meet in June

The Lake Superior Mining Section of the National Safety Council is to meet at the Hotel Duluth, Duluth, Minn., on June 27 and 28. The program committee has announced that among the prominent men who will address the conference are S. R. Elliott, general manager, Cleveland Cliffs Iron Co., Ishpeming, Mich.; Dr. W. O. Hotchkiss, president, Michigan College of Mining and Technology, Houghton, Mich.; Albert Mendelsohn, general superintendent, Copper Range Co., Painesdale, Mich.; John Northwood, safety manager, Bethlehem Steel Co., Johnstown, Pa.; E. W. Corn, National Safety Council, Chicago, Ill. There will be technical papers and discussions by men connected with the local mining companies.

Practically all of the iron mining companies in the Lake Superior District will have exhibits of safety devices which are used at their various properties on display during the conference. Fifteen safety engineers of the district will participate in the round-table discussion of unusual accidents which will be a feature of the second day of the program. E. W. R. Butcher, Republic Iron & Steel Co., is chairman of the executive committee of the Lake Superior Section.

Ore Discovery at New Quincy

An ore discovery of importance has been made at the property of the New Quincy Mining Company in the Park City district, Utah. The New Quincy is a reorganization of the Thompson Quincy Consolidated Mining Company. Its property also includes the Little Bell group.

It is reported that ore has been drifted on for 30 feet with a width of 10 feet or more. It is a bedded deposit in the Park City formation. The ore is of high grade and contains silver, lead, gold and copper.

Exploration Begins in Nevada's Newest Gold Camp

The new gold camp of Wahmonie in southern Nye County, Nev., is a scene of activity. It is a mushroom city with hundreds of tents and with frame structures springing up along the main street. The population is estimated at 1,200 by the miners' protective committee. More than 1,500 claims have been staked and prospecting is active over a constantly broadening area.

The Wahmonie Mines Company, controlled by George Wingfield, has purchased the Buchhorn group from Lefler and McCrea. The sinking of a shaft on the vein has been started with two shifts working.

FILE BRIEF FAVORING PERCENTAGE DEPLETION FOR METAL MINES

The Tax Division of the American Mining Congress has filed on behalf of the metal mining industry a brief with the Senate Finance Committee in favor of a provision in the new tax law allowing depletion for metal mines at the rate of 15 percent of gross income. It is pointed out that discovery value has been denied the mining industry on ore discovered after March 1, 1913, in cases where the newly discovered ore was part of an existing mine and was to be developed and extracted through existing workings; where the newly discovered ore was an extension of a previously known vein or deposit; and where ore existed, but was held by the Internal Revenue Bureau not to be well enough defined to justify its inclusion in the original valuation; and that the 1926 amendment afforded but little relief.

Statement is made that it is believed that Treasury officials are satisfied that the proposed 15 percent rate is reasonable as a basis for depletion in the case of all metals. It is stated that this rate will prevent future errors in valuation, such as under estimates of tonnage and errors of judgment in applying factors involved in estimating the pres-

ent worth of such tonnage as of a basic date. Prior returns, it is stated, show that 15 cents out of each dollar received from the sale of ore is less than the average depletion allowance for each metal and all metals averaged together. It is pointed out that discovery value will become more important in the future.

"Discoveries are essential to the existence of many of the important branches of the metal mining industry," says the brief. "Without discoveries in the future, this country would have to depend upon foreign ores. Discovery depletion allowances will increase as the result of future discoveries of new mineral deposits, which will take the place of existing deposits as they are exhausted. The percentage plan will not materially affect the present amount of income taxes derived from the metal mining industry, but, due to the limitation to 50 percent of net income, may result in an increase in revenue. Under the plan, where it is availed of by the taxpayer, the Government will derive a tax in all cases where the metal mining taxpayer has an operating profit, no matter how small, on at least 50 percent of the net income before deducting depletion."

American Metal Company Purchases Presidio Mine

The American Metal Company has exercised its option on the property of the Presidio Mining Company at Shafter, Tex., which it acquired early in 1926. The Presidio mine is practically the only silver producer in Texas. Production began in 1883 and a total of approximately 20,000,000 ounces of silver has since been produced. The ore is treated in a 300-ton cyanide plant.

Sullivan Zinc Plant in Operation Soon

The electrolytic zinc plant, being built at Kellogg, Idaho, by the Sullivan Mining Company, is expected to be completed and in operation before the last of April. The present plant, which is the first of three units, is to have a daily capacity of 50 tons or more of metallic zinc, and it is probable that as soon as the first unit is in operation erection of the second similar unit will proceed.

The Star mine at Burke, owned by the Sullivan, will be the principal source of zinc, and zinc concentrates from the Sidney mine, treated at the Bunker Hill

Sweeny mill, will also be handled by the new plant. Ores from other Pine Creek properties will be accepted for treatment later on.

North Butte Reorganization Plan

The reorganization plan as submitted to stockholders of the North Butte Mining Co., Butte, Mont., provides as follows:

Capitalization changed from 1,000,000 shares \$10 par value to 1,500,000 shares, no par value; present stock to be exchanged share for share and the increased stock to be offered to present stockholders at not less than \$2.50 per share; that bonds be accepted in lieu of cash; that no stock be offered except first to present stockholders; and from funds raised, present indebtedness be liquidated and development started. They also provide for an increase in the number of directors from 9 to 15. The above are the recommendations of the Stockholders' Protective Committee, of which Arthur Perham is chairman. The indebtedness of the company is approximately \$685,000, and a conservative valuation of the property is reported as \$8,000,000.

Couder d'Alene Mines Consolidate

On February 29 the formal consolidation of the Jack Waite Mining Co. and the Silver King Mining Co. was accomplished by each company filing a deed transferring all its assets to the Jack Waite Consolidated Mining Co. The consolidation gives the new company 51 adjoining claims on the Montana-Idaho state line. The ore is silver-lead and for the most part free from zinc. The mill capacity is being increased to 200 tons a day, and the shaft is being sunk from the tunnel level to a depth of 200 feet.

Anaconda Plant Makes 150 Tons of Zinc Daily

The recently completed electrolytic zinc plant of the Anaconda Copper Co., at Anaconda, Mont., is now in full operation. The Montana Power Co. is supplying about 30,000 horsepower daily.

Average daily production of high grade zinc is approximately 150 tons, although it is occasionally up to 160 tons.

Phelps Dodge Corp. To Abandon Old Copper Workings

The Czar and Southwest mines, the oldest copper workings in the Bisbee district of Arizona, are to be abandoned, according to an announcement by the Phelps Dodge Corporation. No reduction in the Phelps Dodge workings will result, however, as all the men will be transferred to other divisions. Many miles of exploration work has been done in recent years without appreciable results and the decision to close the two properties was reached after thorough exploration of the area.

Federal Inaugurates an Accident Contest

A cash prize of \$100 will be given the ground boss, \$50 to the mill man and \$5 to each employe of the Federal Mining and Smelting Co. that has the best accident record between March 1 and December 1, according to T. W. McNeely, safety engineer of the company.

The Federal Co. has found that contests of this nature tend to reduce the accidents at its properties. The company is working only 4 of its 14 mines at present.

The United Verde Extension Mining Co., Jerome, Ariz., has presented a large plot of land, situated on the mesa above Pugh Hill, for an airport at Cottonwood.

The Hon. William Sloan Dies

The Hon. William Sloan, Minister of Mines of British Columbia, Canada, died Friday, March 2. Mr. Sloan was several times elected a member of the British Columbia Parliament, and in 1916 he was chosen Minister of Mines by Premier Brewster. He held this position ever since, but at various times has also been minister of fisheries and provincial secretary of state. The mines portfolio under his administration was so conducted that it practically never was attacked by his political opponents, and in recent years he was acknowledged the most popular official in the province. Mr. Sloan was a Klondike pioneer, his claim on Eldorado Creek being the scene of the discovery that first attracted attention to that part of the district and brought about the rush to the northland in 1898. He is survived by his wife and two sons, Gordon McGregor Sloan, an attorney in Vancouver, and William Sloan, Jr., in school.

Ontario Mineral Production Sets New Record

Preliminary report of the Ontario Department of Mines for 1927 shows a record production of \$89,839,569 from the mining industry, an increase of about \$4,750,000 over the previous year.

The 1927 production is made up of \$62,766,450 of metallic minerals, of

which more than half represents gold, \$7,343,176 of non-metallic minerals, \$13,781,340 of structural materials and \$5,948,603 of clay products.

Silver, which led all the other metals at the end of 1926 in the total value of production, has now fallen behind gold and nickel, total production to the end of 1927 being \$239,270,323, compared with \$249,143,444 for gold and \$243,178,690 for nickel.

Oregon Copper Co. May Build Flotation Plant

Plans are being considered for the erection of a 300-ton flotation plant in Baker County, Oreg., at the Mother Lode mine operated by the Oregon Copper Company. No definite announcement has been made as yet, but present plans call for carrying on a series of treatment tests prior to drawing up specifications for buildings and flow sheets. The mill being considered is said to be in the nature of a pilot plant and built with a view of enlarging.

Development operations at the Mother Lode mine have been continuous for more than four years, under the management of John Arthur, and more than 15,000 feet of underground work is reported completed, with large tonnages of gold-copper ores exposed.

Belmont Copper Building Mill

The Belmont Copper Mining Company, Superior, Ariz., is building a pilot mill of 100 tons daily capacity. The final flow sheet which will form the basis for a larger mill will be worked out in this initial unit. The mill will be all flotation, and the method of treatment will include coarse crushing, grinding and selective flotation. Concentrates will be shipped to the Magma smelter.

Electric Mine at Weepah Attached

The Electric mine at Weepah, Nev., has been attached by Sheriff W. B. Merver, following a suit for \$7,300 filed against the Electric Mining Company by Ivan Jeffres, former secretary, and other employes. All work at the mine has been stopped. The strike of high-grade gold ore which caused the rush to Weepah just a year ago was made on a claim included in the Electric mine.



Kansas City Star.

Next time let's get a written order

Buckeye Lead and Zinc Co. to Build Mill Near Quapaw, Okla.

C. H. Weaver and associates of Toledo, Ohio, have rejuvenated the Buckeye Lead and Zinc Company, and will begin erection of a 200-ton concentrator on the Quapaw Boarding School eight acres, southeast of Quapaw, Okla., immediately.

There are 30 drill holes near the old workings, the records of which show good ore. There are other drill holes on the lease which also show ore, Mr. Weaver announced.

Lucky Bud Building Mill Near Joplin

The Lucky Bud Mining Company has purchased the old Bernard mill west of Joplin, Mo., and is moving it to its lease on the Connor land. The Lucky Bud mine is just half a mile west of the old Kentucky-Joplin mine.

It is expected that the mill, which will be of 150-ton capacity, will be completed in about three weeks, according to Snowden Marquiss, manager.

About 200 tons of the ore being mined was hauled to a custom mill at Galena and a test run made which ran 12 percent zinc and 3 percent lead, Marquiss said. The zinc is of high grade and the concentrates milled over the custom mill averaged 61.80 percent metallic zinc.

Missouri School of Mines Offers Fellowships

In cooperation with the United States Bureau of Mines and the State Mining Experiment Station, the School of Mines and Metallurgy of the University of Missouri offers four fellowships. These fellowships are open to graduates who have the equivalent of a bachelor of science degree and have had the proper training in mining, metallurgy or chemistry, and who are qualified to undertake research work. The income of each fellowship is \$800 for 10 months, beginning September 1, 1928. Fellows pay fees amounting to approximately \$42 per year.

Their class work will be directed by the heads of the departments of instruction, but the greater portion of their time will be spent in research work under the direction of the Bureau of Mines staff resident at the School of Mines. The purpose of this work is to undertake the solution of definite problems confronting the mining and metallurgical industries of the State of Missouri. For 1928-29 the four fellowships will be granted in the following subjects: Ore dressing—Problems in gravity concentration and flotation.

ARIZONA PROPERTIES HANG UP EXCELLENT SAFETY RECORD IN 1927

Less than one and one-quarter accidents per 10,000 shifts was the record of Phelps Dodge Corporation and Old Dominion Co. during 1927, according to an announcement recently by P. G. Beckett, general manager. This record almost cut last year's record in half, and is only one-tenth as great as the record for 1924.

The year's record shows that only 263 lost time accidents occurred on the properties of the corporation, embracing the Copper Queen mines and mills in Bisbee, the Copper Queen copper and lead smelters in Douglas, the mines and mills at Nacozari, the mines and mills at Morenci, the smelter at Clifton, and the properties of the Old Dominion Co., both mine and mill, at Globe. These 263 accidents compare with 499 lost time accidents in 1926, 1,394 lost time accidents in 1925, and 2,386 lost time accidents in 1924.

The Moctezuma Copper Co., at Nacozari, won the James Douglas Memorial Safety Trophy for 1927, having also won the trophy in 1926. The Douglas Memorial Trophy is competed for on the basis of the number of accidents per thousand shifts, each accident which causes loss of time having a bearing on the percentages of the particular branch for which the injured employee is working.

The record set up by the Moctezuma Co. to win the trophy was .062 lost time accidents per thousand shifts, followed very closely by a record of .071 lost time accidents per thousand shifts at the Morenci Branch of Phelps Dodge at Clifton and Morenci. Reducing the percentages to work-day figures, the Moctezuma rate was only a little more than 6 accidents for every 100,000 shifts worked, and the Morenci rate was slightly more than 7 accidents for every 100,000 shifts.

The latest figures available covering accident records in all copper mines in the United States show 1,179 lost time accidents per thousand shifts or almost 118 accidents for every 100,000 shifts worked. Employees of the Moctezuma

Copper Co. reduced this average to where only one-twentieth as many accidents occurred at Moctezuma as could be expected under the national average. And Morenci suffered only one-seventeenth as many accidents as shown by the average for all copper mines in the country. The record for all Phelps Dodge and Old Dominion properties was .122 lost time accidents per thousand shifts or a little more than 12 accidents for every 100,000 shifts worked which is less than one-tenth the average for all copper mines.

The underground mining departmental trophy for 1927 was awarded to the Moctezuma Copper Co., and the miscellaneous surface departmental trophy went to the Copper Queen at Bisbee. The Morenci Branch took two departmental trophies, one in the crushing-concentrating department and the other in the smelting department, while Old Dominion took the power-mechanical all shops departmental trophy.

To the Old Dominion Co. went the Severity trophy which, like the James Douglas Memorial Safety Trophy, is competed for annually by these different companies.

"The reduction in accidents at the properties of Phelps Dodge Corporation and Old Dominion is indeed gratifying," said Mr. Beckett, "and demonstrates conclusively the great value of cooperation between every employee and the corporation's officials in this work. It is encouraging to all employees who have given such hearty cooperation in this safety movement, and to whom the credit for this satisfactory decrease in accidents should be given."

Total lost time accidents at Phelps Dodge and Old Dominion properties and the percentages per 1,000 shifts for the past four years are as follows:

Year	Total Accidents	Per 1,000 Shifts
1924	2,386	1.047
1925	1,394	.629
1926	499	.228
1927	263	.122

Fellowships at Michigan College of Mining

The Michigan College of Mining and Technology is offering for the academic year of 1928-1929 12 graduate fellowships carrying stipends of \$1,200 each. Fellows will register as graduate students at the Michigan College of Mining and Technology and will become candidates for the degree of Master of Science.

Holders of these fellowships will be engaged in the study of the various problems in connection with the general research program at the college for which the State of Michigan has provided the sum of \$50,000 for the coming year. This research program deals with all phases of the iron and copper resources of Northern Michigan and their utilization. Appropriate parts of this research program are carried on in cooperation with the mining companies.

and the United States Bureau of Mines.

Fellowships are open to all college graduates who have the equivalent of a Bachelor of Science degree and are qualified to undertake research in chemistry, geology, geophysics, mechanical engineering, metallurgy, ore dressing, or mining.

Molybdenum Production Increased in 1927

Three companies produced molybdenum ore in the United States during 1927—the Climax Molybdenum Co., at Climax, Colo.; the Molybdenum Corporation of America at Sulphur Gulch, near Questa, N. Mex.; and the Santo Niño Mining Co., at Helvetia, Ariz.—according to data collected by the United States Bureau of Mines. A total of 216,595 short tons of ore was milled, from which concentrates carrying from 75.14 to 95.4 percent of molybdenum sulphide, MoS_2 , equivalent to 2,299,217 pounds of elemental molybdenum, were obtained, an increase of about two-thirds over 1926. Of the concentrates produced 2,286,075 pounds, valued at the mines at \$1,858,786, were shipped. Nearly all of the output was made into calcium molybdate, in which form it is added to steel.

Perhaps the most important event of the year in the molybdenum industry was the announcement that the price of the metal contained in calcium molybdate would be reduced at the beginning of 1928 from \$1.20 per pound to 95 cents per pound. The reasons for the reduction were that the larger sales had allowed mills to be run more nearly at full capacity with consequent lower costs and that the lower prices would probably encourage a still larger use.

\$1,000,000 in American Machinery Being Shipped to Russian Gold Fields

American dredge, drilling, mine and laboratory equipment valued at over \$1,000,000 is being shipped to the Soviet gold trust, Soyuz-Zoloto, by the Amtorg Trading Corporation, according to an announcement. American machinery will be used to increase the Russian gold production considerably beyond its present volume.

Among purchases made here were those of electrical equipment worth \$100,000 for dredges being built in the Soviet Union. The largest dredge in the world is at present being installed in Siberia by the Lena Goldfields Company, Ltd., which has a large concession in Russia. Other equipment for dredges obtained here is valued at \$200,000. The remaining part of the purchases consists of equipment for placer mining, drilling supplies and chemicals for the treatment of ores.

Durand A. Hall, Mining Geologist and Engineer of Berkeley, Calif., has returned to Sonora, Mexico, where he has charge of exploration of a lead, zinc, silver property.

Earl E. Hunner, General Manager for the M. A. Hanna Company at Duluth, Minn., is in California.

Carleton Merritt, of Duluth, Minn., has been made a director of the Consolidated Copper Mines Company to succeed his father, the late Thomas A. Merritt.

William H. Crago, Mining Engineer of Duluth, Minn., has been in Arizona on professional work.

Gordon R. Campbell, President, and E. J. Collins, Vice President of the Calumet and Arizona Mining Company, have recently visited Bisbee, Ajo and Jerome, Ariz., on a tour of inspection of the company's properties.

Cleveland E. Dodge has recently visited the properties of the Phelps Dodge Corporation in the Southwest.

Robert I. Kerr, formerly Secretary of the California Metal and Mineral Producers' Association, accompanied by Mrs. Kerr, have left San Francisco for a tour around the world.

Clyde E. Weed, Assistant General Manager of the Inspiration Consolidated Copper Company, has returned from a month's vacation in Hawaii.

T. F. Field, Mining Engineer of Duluth, Minn., and Director of the Roan Antelope Copper Company, has sailed for England en route to Northern Rhodesia, Africa, to inspect the company's properties.

J. Parke Channing, Vice President and Consulting Engineer of the Miami Copper Company, has visited the Miami mine and is now at Berkeley, Calif.

A. F. Beasley has been appointed Superintendent of the Bunker Hill smelter, succeeding the late M. H. Sullivan. Mr. Beasley has been on the Bunker Hill staff a number of years, serving the past several years as assistant superintendent. P. C. Feddersen and J. B. Schuettenehl will serve as assistant superintendents.

Harry A. Wright, formerly mine foreman of the United Verde Copper Mining Co., is now supervising contract engineer with the Inspiration Cons. Copper Mining Co.

John B. Rawlings, of El Paso, Tex., has been named secretary of the Ahumada Lead Co. and the Erupcion Mining Co., of Los Lamentos, Chihuahua, Mexico.

Carl Lausen, formerly geologist at the Arizona Bureau of Mines, and now with the United Verde Copper Co., is making a complete survey of the mineral possibilities of the Oatman District, Ariz.

Grover J. Holt, for eight years with the Oliver Iron Mining Co., in the Chisholm District of the Mesabi iron range, has accepted a position with the Manganiferous Iron Co., Crosby, Minn., as mining engineer.

Walter D. Nebeker has been elected president of the Salt Lake Stock and Mining Exchange for the third consecutive year.

Personal Items

Charles H. Claypool, formerly general superintendent for the Tod-Stambaugh Co., Hibbing, Minn., Mesabi iron range operators, has accepted a position as assistant general manager of the Woodward Iron Co., Woodward, Ala.

A. N. Bakhtiarov, chief engineer of the Yurt, the Soviet Southern ore trust, is in this country with three other officials of the trust to visit Michigan, Alabama and other ore centers for a three months' study of American production methods and of the mining equipment market.

I. N. Bayless, of St. Louis, has been appointed general superintendent of the Utah Fuel Co.'s coal properties.

H. T. Wilson has resigned the presidency of the Red Jacket Consolidated Coal and Coke Co., of Columbus, Ohio, and has severed his connection with affiliated companies in order to devote his entire attention to other business. His successor has not yet been named.

Harry Woods, who has been general superintendent for Cosgrove & Co., at Marion, Ill., for the past four years, and in the operating department of the company for 10 years, has joined the Chicago office as assistant to the executive vice president and general manager.

H. S. Gay, general superintendent of the Gay Coal & Coke Co., Logan, W. Va., is being urged to accept the Republican nomination for the legislature in Logan County, according to reports.

Frederick R. Low, former president of the American Society of Mechanical and Electrical Engineers, and Prof. L. B. Chapman, of the Massachusetts Institute of Technology, have been elected members of the Shipping Board's fuel conservation committee.

Edgar J. Gealy, formerly with the Lehigh Valley Coal Co., and for the past five years on the editorial staff of *Coal Age*, has accepted a position with the engineering staff of the Pittsburgh Coal Co., in Pittsburgh.

Charles E. Ash has been elected a director of the Lehigh and Wilkes-Barre Coal Company, succeeding the late Douglas E. Bunting.

Hugh G. M. Kelleher, a member of the banking firm of Joseph Walker & sons, has been elected a member of the board of managers of the Lehigh Coal and Navigation Company, succeeding the late Rodman Wanamaker.

L. F. Rains, San Francisco, president of the Carbon Fuel Co., and president of the Utah Coal Producers' Association, has been appointed general manager of the Columbia Steel Corporation of which he had been acting general manager of late. Mr. Rains had been vice-president of the company since its organization a few years ago.

William I. Reilly, former member of the Colorado Industrial Commission, has been appointed industrial relations representative of the Colorado Fuel & Iron Co. Mr. Reilly will assist J. B. Matteson, industrial representative, in the administration of the employee representation plan of the company. Governor Shoup appointed Mr. Reilly to the industrial commission in 1919 and he served in that capacity for eight years.

Illinois Operators Break With Union

The Illinois Coal Operators' Association has severed relationship with the United Mine Workers until the miners' organization agrees to a wage reduction.

The decision to challenge the union's adherence to the Jacksonville agreement was approved by the association March 28, three days before the expiration of a temporary agreement between the operators and workers.

Individual operators were left free to negotiate with the union. But, declared W. J. Jenkins, of St. Louis, the newly elected president of the association, "comparatively few mines will operate after April 1."

"The prospects seem to guarantee," continued Jenkins, "that the Illinois coal industry will suffer a further severe slump with all such increased idleness of mines and men may mean in the way of detriment and damage to all parties concerned, the mine owners, the miners, mine communities, railroads, coal-consuming utilities and industries, and, in fact, the state as a whole."

The operators' association will renew its offer of a wage of \$6 a day for day labor and 84 cents a ton for tonnage men, Rice Miller, retiring president, stated.

Twelve mines in the Bellville District have announced that they will continue to pay the scale demanded by the union. These include five mines of the United Electrical Coal Co., three of which are at Danville, one at Cuba, and one at Freeburg; the Troy Coal Co. at Troy; the East Side Coal Co., and Henrietta Coal Co., both of Edwardsville, and Mine Coal Co., Carlinville.

Two large companies operating in Franklin County, one of the leading Illinois coal producing areas, have announced they will shut down. These are the Chicago, Wilmington and Franklin and the Brewerton Coal Companies. Operators expect that 15,000 men will be idle after March 31. It was reported at West Frankfort that many miners are leaving that vicinity.

Indiana Strip Mines Sign

Strip mine operators of the Indiana district signed a contract with the United Mine Workers March 28 to continue operations under the Jacksonville wage scale, until March 31, 1929.

The agreement, which is similar to the one under which strip mines now are under contract until April 1, 1928, will affect approximately 1,500 men in the Indiana field, Harvey Cartwright, president of the union district, said.

Strip mines have worked fairly steady the greater part of the past year although production amounts to only a small percent of the normal tonnage of the district.

YEARBOOK ON MECHANIZED COAL MINING

In response to a demand from the coal industry, The American Mining Congress will shortly publish a yearbook on mechanized mining. It will make available the most comprehensive knowledge on the application of mechanization to coal production that has ever been issued. The yearbook will include the following:

(1) A survey of the progress of mechanized mining in the coal industry, based upon 15 months' investigation conducted by G. B. Southward for The American Mining Congress.

(2) A comprehensive study and survey of the possibilities of applying mechanical mining in the various coal fields of the United States.

(3) A complete set of reports on actual mining operations which have appeared for the past year in THE MINING CONGRESS JOURNAL.

(4) Illustrations and specifications for each loading machine, conveyor, scraper, etc.

(5) A complete bibliography on mechanized mining.

Altogether, the book will contain approximately 400 pages, will be nicely bound in convenient size, and will sell at \$3 per single volume. Special rates will apply when purchased in quantities of five or more.

Colorado Board for Mine Unions

Unionization of the Colorado coal fields was advocated March 20 by the State Industrial Commission as a means of preventing strikes.

The recommendation was made in a report reviewing the causes of the I. W. W. strike which tied up coal production in the state for a time last winter and led to disorders resulting in several deaths.

Restitution of collective bargaining through non-company unions was urged by the commission, together with the establishment of inspection or pit committees to represent the workers.

Aside from the Rockefeller plan of employe representation, in effect in the mines of the Colorado Fuel and Iron Company since the strike of 1913-1914, the other mines of the state have been operating on the open-shop basis since the United Mine Workers strike, called in 1922.

"Experience has shown that it is not to the best interests of the employes to leave their welfare exclusively in the hands of the employer," the commission said in its report. "The only safe and sure protection for the employe consists of his ability to bargain collectively."

Reasons for the strike were set forth as follows:

"Lack of organization among the miners; I. W. W. promises of 'everything'; dissatisfaction with coal weights; interference with the election of check weighmen; bad air and lost time in waiting for tools and other necessities."

A report dealing with wage conditions will be issued by the commission soon.

Southwest Operators Threaten To Go Non-Union

Unless a wage agreement is reached by April 1, coal mine operators in the southwest may attempt to operate their mines on a non-union basis, W. L. A. Johnson, commissioner of the Southwest Interstate Coal Operators' Association, stated March 16, following the break-up of conferences with union miners' representatives at Kansas City.

Johnson, who is chairman of the operators' committee seeking readjustment of the wage scale, said the operators of large mines in the district, comprising Missouri, Kansas, Oklahoma and Arkansas, were forced to compete with smaller shafts, where coal can be produced and marketed much cheaper, and that as a result of this competition there had been a decrease in production in the southwest. These smaller mines, he said, in many instances were operated by non-union miners for \$5 a day.

James Skahan, district president of the United Mine Workers of America, announced a few days later that mines in district 14 would operate after April 1 only through individual contracts of operators with district officials.

The district president also said that similar action would be taken in districts in Missouri, Oklahoma and Arkansas.

Otto Herres Heads Rocky Mountain Coal Operators

Otto Herres, Salt Lake City, Utah, president of the United States Fuel Company, was elected president of the Rocky Mountain Coal Operators' Institute at the closing session of the semi-annual

meeting held in Denver, Colo., early in March. Action taken provides for holding the winter meeting of the institute in Salt Lake City as well as Denver. Rock Springs, Wyo., will be offered the summer meeting this year.

Benedict Shubert, secretary-treasurer of the institute, was reelected. Other officers are: Vice-president, Utah, H. L. Pascoe, manager of the Blue Blaze Coal Company, Salt Lake City; Wyoming, Glen Knox, superintendent of the Gunn-Quealey Coal Company, Rock Springs; New Mexico, D. B. Hanger, manager of the Diamond Coal Company, Albuquerque; Colorado, R. M. Perry, general manager of the Moffat Coal Company, Denver. The executive board is made up as follows: Utah, George A. Murphy, president of the Spring Canon Coal Company, Salt Lake City; I. N. Bayless, general superintendent of the Utah Fuel Company, Castlegate; Wyoming, T. H. Butler, manager of the Union Pacific Coal Company, Hanna; William Redshaw, manager of the Megeath Coal Company, Rock Springs; New Mexico, Oscar Huber, president of the Albuquerque & Cerillos Coal Company, Albuquerque; Sharp Hansen, general manager of the Gallup Southwestern Coal Company, Gallup; Colorado, S. M. Thompson, superintendent and general manager of the Caliente Coal Company, Walsenburg; C. W. Brown, manager of the Hayden Brothers Coal Company, Denver.

Changes in Permissible List of Explosives

A list of additions, removals and changes made from July 1, 1927, to January 31, 1928, in the list of explosives approved by the Bureau of Mines as "permissible" has been published as Serial 2854. The list supplements that contained in Serial 2818, which covered explosives approved by the Bureau prior to January 30, 1927.

Record 1927 Lake Coal Shipments

According to the annual report of the Lake Carrier's Association whose headquarters are in Cleveland, the 1927 navigation season on the Great Lakes smashed all previous records, in all, 17 high records being reported, including the movement of bituminous coal, 32,851,000 net tons, the previous high mark being in 1923, when the net tonnage moved was 29,656,000 tons. The May movement of bituminous coal set a new record for a month's movement, the total being 5,178,000 net tons, the previous high month record being 4,698,000 tons in June, 1923.

WEST VIRGINIA COMPANIES ASK INJUNCTION ON I. C. C. FREIGHT RATE ORDER—DECISION APRIL 14

Coal companies of West Virginia, Kentucky, Virginia and Tennessee have petitioned the Federal court at Charleston, W. Va., for an injunction to restrain the Interstate Commerce Commission from enforcing an order suspending lower lake cargo coal freight rates.

The companies asked that southern railroads be restrained from enforcing the order of the commission. Following the recent decision of the Interstate Commerce Commission in the Lake Cargo case, the southern roads offered to reduce Lake Cargo rates voluntarily, but the commission ruled that the roads could not put the new schedule of rates into effect.

The operators in their bill claimed that unless enforcement of the suspension order is enjoined "they will be irreparably injured and damaged in their business and will be deprived of their property by the enforcement of an unlawful order of the commission." They charged that already the effect of the commission order is apparent on the Lake Cargo coal trade.

The petition was argued before a special tribunal in the district court at Charleston, beginning March 19. The jurists were Circuit Court Judges John J. Parker and Elliott Northcott, and District Judge George W. McClintic, of southern West Virginia.

P. J. Farrell, chief counsel of the Interstate Commerce Commission, argued that the reduction of rates was disallowed the southern carriers because the commission found that the rate sought would not yield the carriers in that rate group a net revenue equal to a fair return on the money invested. Judge McClintic asked him if the railroad would

not have any coal to haul, as the operators contended, how they could produce revenue even with the higher rate.

Farrell, in explaining the freight differential between the northern and southern fields, emphasized that the average haul from the southern territory was twice as far as from the northern territory. He held that was "a natural advantage" to the northern operators which the commission could not take away. The southern operators, he declared, also enjoyed an advantage in that the record showed they were able to mine coal more economically than the northern operators.

The railroads involved in the case, the Chesapeake and Ohio, the Norfolk and Western, the Louisville and Nashville and the Cincinnati, New Orleans and Texas Pacific railroads, in their answers to the operators' suit stated their willingness to place the reduced rates into effect if the court approved.

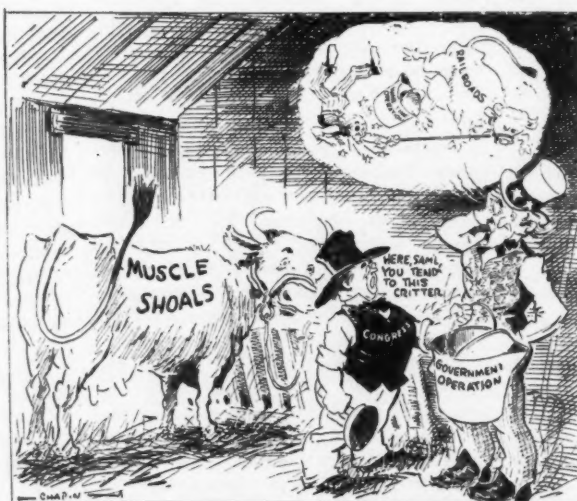
Intervening petitions joining the operators were filed by consumers of the northwest territory and the State of West Virginia, and intervening petitions as defendants were presented on behalf of the operators of the Cambridge, Ohio, field, the Pittsburgh district, and the Baltimore and Ohio, the Pennsylvania, New York Central and Big Four railroads.

The southern operators charged directly in their bill that "the motivating cause for the entry of the order complained of was the desire to give the coal fields of western Pennsylvania and eastern Ohio a still greater rate advantage" over coal producers of southern West Virginia, eastern Kentucky, Virginia and Tennessee, "than they already had in order to compensate them for certain economic disadvantages under which they had labored."

The operators' bill further charged that "the commission exceeded its lawful authority in condemning the said reduced rates upon that ground" and it was claimed the commission prejudged the issue involved in the suspension proceedings.

It has been announced that a special court would hand down a decision at Richmond, Va., April 14 on the application injunction.

Meantime the date on which the railroads were directed to cancel their reduced rates, previously suspended by the commission, was extended from March 28 to April 20.



Philadelphia Public Ledger.

No wonder he hesitates!

Receivers Named for Bertha Consumers Coal Co.

The first large financial crash due to the prolonged bituminous coal strike occurred recently with the failure of the Bertha Consumers Coal Co., one of the largest Pittsburgh operators. Federal Judge W. H. S. Thompson named John H. Jones, president of the company, and Fred E. Powers, a director, receivers under a joint bond of \$100,000. The defendants joined with the plaintiffs in asking for a receivership. The company has bonded indebtedness of \$2,500,000 and other indebtedness of \$2,454,000. Assets were said to be greatly in excess of liabilities. The company had been in financial difficulties for some months and recent approval of \$1,000,000 increase in bonded indebtedness by stockholders was intended to place the company on a sound basis. Watts-River Co., of Huntington, W. Va., and the Stevenson Co., of Fairmont, W. Va., were complainants.

Activities in Forestry

The growing interest of the mining companies of Pennsylvania in growing timber on their own lands is shown in a report of the State Department of Forests and Waters regarding the activities of the Wilmore Coal Co., with headquarters at Windber.

During the last five years this company has planted 1,920,000 forest trees and has ordered 400,000 tree seedlings additional from the department for planting this spring. It will also plant 250,000 seedlings grown in its own nursery. The species include jack pine, white pine, Norway spruce, larch, pitch, Scotch pine, red pine, white ash and red oak.

Elwood Burgess, superintendent of the company's land department, in discussing the cost of planting with District Forester V. M. Bearer, of the Forbes Forest District, Ligonier, said that the cost of planting for the years 1924, 1925, and 1926, was approximately 1½ cents per tree, and in 1927, the cost was reduced to one cent per tree. The reduction in cost of planting, the department said, was attributed to improved methods used in planting rather than to reduction in wages.

The company maintains a small tree nursery comprising a half acre in area, and the inventory of one and two-year old seedlings on January 1, showed there were 837,300 trees growing. The total expense of the nursery, exclusive of interest charges, to December 31, 1927, was \$1,826.50. Mr. Burgess estimates the value of his planting stock today at \$3,491.30 and bases his estimate on quotations given by some of the reliable commercial tree nursery companies of the eastern states.

WEST VIRGINIA LED IN 1927 COAL PRODUCTION

West Virginia led all other states in the production of bituminous coal in 1927, with a total of 161,580,000 tons, as against 131,007,000 for Pennsylvania, according to the Bureau of Mines. This is the first time that Pennsylvania has been forced to yield first place as a bituminous producer, but, counting anthracite, Pennsylvania leads with a combined total of 211,659,000 tons.

Kentucky was third, 72,626,000 tons; Illinois, 45,408,000; Alabama, 18,400,000; Indiana, 17,699,000; Ohio, 14,668,000; Virginia, 13,366,000; Colorado, 9,693,000; and Wyoming, 7,085,000 tons. At the end of 1926, 759,000 men were employed in coal mines, of whom 165,000 were in the anthracite region and 594,000 in bituminous fields. Of the total, 122,000 men worked on the surface operating the tipples and preparing the

coal for market, while 637,000 labored underground.

The bureau states that the output per man per day in American mines is from twice to four times that in Europe, partly because of wider use of electrical machinery, but chiefly because of more favorable natural conditions. In American bituminous mines the daily output per worker in 1926 was 4.50 tons, and in anthracite mines, where geological conditions are more difficult, it was 2.09 tons.

The increasing use of machinery is shown by the fact that 71.7 percent of bituminous was cut by machine in 1926 and that 16,900,000 tons were mined by steam or electric shovels in open pits. A strip pit in Montana had an output of 48 tons per man per day, or ten times the usual product in mining underground.

Emery Heads Cambridge Collieries

William Emery, Jr., for eight years resident engineer of Madeira, Hill & Company, Philadelphia, has assumed the presidency of the Cambridge Collieries Company, Cleveland, Ohio, succeeding the late A. A. Augustus. This company owns 10 mines near Cambridge, Ohio, and normally is the Canadian Pacific Railway's chief source of coal supply.

Mr. Emery became associated with Madeira, Hill & Company after his graduation from Yale, and within a few years was made superintendent of the company's Colonial Collieries at Natalie, Pa. Then he was assistant superintendent of the company's anthracite mines at Frackville, where he remained for several years. Eight years ago he was promoted to resident engineer.

Coal Mine Mechanization To Be Decreased By Ohio Section, A. I. M. E.

The Ohio section of the American Institute of Mining and Metallurgical Engineers has arranged a meeting to be held at Columbus, Ohio, April 21. The subject of the meeting will be "Mechanization of Coal Mines," and members of the National Coal Association, American Society of Mechanical Engineers and the Southern Ohio Pig Iron and Coke Association have been invited to participate. The program calls for an inspection trip in the morning, a luncheon at noon, a meeting at Ohio State University in the afternoon and a dinner at the Faculty Club of the University.

Ohio Judge Issues Eviction Order To Make Way For Open Shop Men

Striking union miners occupying company-owned houses at mines in the Eastern Ohio District, which the operators wish to operate on a non-union basis, must move by May 1, to make room for the non-union men, Federal Judge Hough ruled March 24 at Columbus.

Hearing applications for eviction filed by five coal companies operating mines in the district, Judge Hough granted all of them, save at one mine, which is not operating. The action involves the eviction of 285 families. Considerably more than that number of eviction notices were served by the United States Marshal, but some of the families moved voluntarily and others were not included in the suit.

"Hy-grading"—In Coal Mine

The first record of an alleged coal theft by the actual mining of coal by the man alleged to have stolen the coal, was made at Pottsville, March 30, with the arrest of a 17-year-old youth. The arrest was made at the bottom of a drift of the Haddock Colliery, near Pottsville, Pa.

Detectives testified that they found him digging the coal and that he possessed all the necessary mining tools. The detectives said that hundreds of tons of coal had been removed from this drift after working hours, probably early in the morning. A confession was made which implicates five others.

Canadian Coal Imports and Production in 1927

About 95 percent—specifically 18,314,248 tons—of Canada's coal imports in 1927 came from the United States. Of the 15,178,640 tons of bituminous coal brought in during the year, the United States furnished 15,038,008 tons, Great Britain 140,309, and Japan 323. The United States was the only source of supply for foreign lignite coal, the trade amounting to 10,829 tons. During the year Canada imported 4,063,619 tons of anthracite, composed of 3,719,326 tons of sized coals and 344,293 of dust. The trade with the United States accounted for approximately 80 percent of this business, made up of 2,943,575 tons of sized coals and 321,836 of dust. Canada brought in 765,778 tons of sized coals and 22,457 of dust from Great Britain, and 4,818 tons of sized coals from Germany and 5,155 from the Netherlands.

The output of domestic coal increased from 16,478,131 short tons in 1926 to 17,411,505 tons in 1927. The 1927 output was valued at \$61,809,672 as compared with \$59,875,094 in 1926. The 500 coal mines in operation represented a capital investment of about \$150,000,000. Exports totaled 1,113,330 tons, as compared with 1,028,200 in the preceding year. A large part of this fuel was shipped to Newfoundland.

Mining Thin Beds of Anthracite

Increased production from thin beds of anthracite is forecast for the future by the Bureau of Mines, which has completed an investigation of the methods of mining such beds in Pennsylvania. The minimum thickness of the beds that will be considered workable will decrease, the bureau predicts. Not long ago beds less than 5 feet thick were considered unworkable, while today in a few places the coal companies are working beds less than 2 feet thick. Some companies now contemplate the necessity of working beds having an average thickness of only 20 inches.

Although operators have installed modern equipment for generating power, up-to-date haulage systems, and coal-preparing machinery, relatively slight improvements have been made in the methods of mining the coal and hauling it from the working face to the main haulways. In districts where the coal measures are relatively flat, operators have begun to study mining by machines and mechanical transportation from the working face to the haulage roads and are introducing these methods into their mines. The study of the progress made in mining and handling coal mechanically in the thinner beds of the anthracite region, the pointing out of what methods have been successful or

unsuccessful, and the demonstration of the opportunity for thorough development of new mining methods, were the special objects of the bureau's investigation.

A feature which influences the mining methods used to some extent is the amount of water to be handled. A survey of the whole anthracite region showed that 10.9 tons of water have to be handled for each ton of coal mined.

Detailed descriptions of the various methods used in mining the thin coal beds in the anthracite region of Pennsylvania are given in Bureau of Mines Bulletin 245, by Dever C. Ashmead, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of 30 cents.

Fellowships At Carnegie Tech

Continuing its program of scientific research in cooperation with the United States Bureau of Mines and two advisory boards representing the mining and metallurgical industries, the Carnegie Institute of Technology will award 10 fellowships in mining and metallurgical research during the coming year.

Fellowships are open to the graduates of colleges, universities and technical schools who are qualified to undertake research investigations. The investigations will be made under the supervision of representations of the Pittsburgh Station of the United States Bureau of Mines and members of the faculty of Carnegie.

Several of the fellowships, it is announced, will be financed by companies and organizations representing the mining and metallurgical industries. In addition, the members of the two advisory boards will assist in promoting the work and in publishing the results of the investigations. Thirty-six bulletins reporting results of separate studies have already been published since the cooperative research was started several years ago, and four more published reports will be available before the end of the summer.

Subjects for research by the fellowships appointed for 1928-29 will be selected in the fields of "origin and constitution of coal," "coal mining," "utilization of coal," "mine safety," and "physical chemistry of steel making."

The Carnegie Institute of Technology has announced a summer course in coal mining, June 6 to July 3, 1928, which is to cover all practical coal mine problems. (The tuition for the entire course is \$15.) All communications concerning the summer course in coal mining should be addressed to Edward Steidle, Secretary, Mining and Metallurgical Advisory Board, Carnegie Institute of Technology, Pittsburgh, Pa.

Explosion Disasters Can Be Eliminated With Proper Preventive Measures

Major mine explosion disasters can be eliminated in this country if the proper preventive measures are taken, according to the Bureau of Mines. At the request of Director Scott Turner, the chief mining engineer of the bureau, George S. Rice has prepared a comprehensive handbook of "Safety in Coal Mining." The following methods of preventing mine explosions are outlined by Mr. Rice in this handbook:

Ventilation, to dilute and carry inflammable gases out of the mine; suitable methods of determining the proportion of such gases in the mine air, to guide the management in furnishing adequate ventilation in every part of the mine.

Rock dusting, to prevent ignition and propagation of explosions of bituminous coal dust.

Use of permissible explosives, to prevent ignition of gas or bituminous coal dusts. Shots of black blasting powder dynamite have caused many disasters.

Permissible electric miners' lamps for illuminating, and magnetically locked flame safety lamps for testing to prevent ignition of gas or bituminous coal dust by open lights or by safety lamps that may be opened underground.

Permissible electric coal-cutting drills, loading machines, and switches used in an approved manner, to prevent ignition of gas or bituminous coal dust by electric sparks which occurs in the use of "open" or nonpermissible electric machinery.

Permissible electric pumps, hoists, compressors, and other stationary machinery and devices properly installed, to prevent ignition of gas.

Approved methods of placing and installation of electric power lines, as in the intake air courses, to prevent ignition of gas or bituminous coal dust.

Limitation of use of trolley locomotives to pure air intakes, outby an open crosscut, and to thoroughly rock-dusted haulage roads, with the object of preventing the ignition of gas or bituminous coal dust. The alternative, which is far preferable, is to use permissible storage-battery locomotives for haulage in all gassy or slightly gassy mines.

Large Mine Freight Tonnage

The Pennsylvania Railroad reports that mine products furnished nearly 61 percent of its freight tonnage in 1927, totaling 135,750,114 tons, including 86,065,345 tons of bituminous coal, 10,043,929 tons of anthracite, and 19,967,163 tons of clay, gravel, sand and stone.

Freight shipments by the railroad included 10,000,000 tons of iron ore, 10,300,000 tons of bar and sheet iron, structural iron and pipe, and 2,900,000 tons of pig and bloom iron.

Seek Permission to Build West Virginia Railroad

Authority to build a new railroad in West Virginia, 29 miles long, running from Swiss to Nallen, was sought from the Interstate Commerce Commission by the New York Central and Chesapeake and Ohio Railroads, acting jointly.

When completed the new line will shorten rail distances on coal hauls materially in the territory, the application explained, and will facilitate interchange of traffic between the two railroad systems.

New Map of Utah Coal Field

A detailed study of the geology and coal resources of the Book Cliffs front between Palisade, Colo., on the east and Sunnyside, Utah, on the west, a distance of about 175 miles, has been made by the U. S. Geological Survey in furtherance of its work of classifying the public lands. For the part of this area in Utah a preliminary geologic map has recently been completed by Geologist D. J. Fisher. This map shows the areal geology of the Book Cliffs front from the southern part of T. 15 S., R. 14 E., Salt Lake meridian, in the vicinity of Sunnyside, eastward to and across T. 16 S., R. 26 E., on the Utah-Colorado boundary, and indicates by dip and strike symbols the structural conditions existing in the area mapped.

A few copies of this map issued in six sheets are available in the offices of the Geological Survey in Washington, D. C.; at 212 Customhouse Building, Denver, Colo.; and at 316 Federal Building, Salt Lake City, Utah, for distribution to those having particular interest in the area. Copies of the supplemental stratigraphic sections will be available at the same offices as soon as they can be prepared.

Germany's Coal Output Highest Since War

Germany's coal output last year was the greatest since the delinication of the new boundaries following the Great War, coming to 153,598,000 metric tons, nearly 6 percent larger than the 1926 production of 145,363,000 tons, according to a report to the Department of Commerce. It was almost 9 percent larger than the 1913 production of 140,753,000 tons within the present boundaries, though considerably less than the total German production of that year, which came to 190,109,000 tons. In addition, Germany produced in 1927, 150,806,000 tons of lignite, 32,261,000 of coke, and 41,434,000 of briquets.

"SIMPLIFIED PRACTICE" HAS 82 PERCENT ADHERENCE

Continued growth of Simplified Practice as a means of eliminating waste in industry is evidenced by the completion during the calendar year 1927 of 18 new Simplified Practice Recommendations, thus bringing the total projects completed to 80, according to a review of the past year's activities of the Commercial Standards Group, Bureau of Standards, by Ray M. Hudson, Assistant Director, in charge.

That simplification yields benefits sufficient to attract manufacturers, distributors and consumers alike is demonstrated in the high degree of adherence shown by recent reviews of 15 of Simplified Practice Recommendations already promulgated. The report shows that acceptors, representing an average of 82.61 percent of the total volume of the industry effected, are following the simplified practice schedules. These recommendations are subject to annual reconsideration to determine the desirability of further eliminations, substitutions or reinstatements. This procedure keeps the Simplified Practice Recommendations up to date and in line with the best current practice of the industry concerned.

Further evidence that simplification is proving of great value to manufacturers and purchasers is found in the increased number of associations accepting the completed recommendations. The list of associational indorsers grew from 686 to 898 during the year; the individual concerns, from 2,775 to 6,876. This means an increasing number of industrial purchasers are specifying simplified lines when buying, because they are finding that such items are usually more readily obtained, that their quality is better, and, in many instances, by reason of the savings wrought through simplification, prices are lower.

"Inasmuch as adherence to the adopted simplified practice recommendations has been most gratifying during 1927, with this increased percentage in acceptors it is safe to assume that the percentage in adherence during 1928 will be much closer to 100 percent.

He cites the following experiences in connection with this form of waste elimination: "One metal lath manufacturer reports reduction of \$140,000 in his inventory, while a manufacturer of eaves trough and conductor pipe reports a \$30,000 reduction in his inventory. One community reports savings of 5 cents per square yard, and another 25 cents per square yard on its paving due to asphalt grade simplification. One lumber company reports reduction of \$250,000 on its inventory, another \$474,000 due to lumber standardization program. A manufacturer of concrete

building units reports savings of \$11,500 per year due to simplification in his field, while another reports savings of \$500 in his office operations alone and another states it has enabled him to reduce the selling price of his product 25 percent. A manufacturer of die-head chasers cites a 20 percent reduction in his inventory, another 65 percent. Many others report better turnover, quicker delivery, and improved service to the trade as benefits accruing from simplified practice.

"During the past year the simplification work reached the point where more effectively to serve industry there was created within the Bureau of Standards a 'Commercial Standards Group,' under an assistant director of the bureau, of which group the Division of Simplified Practice is now a part. The activities of this group will include the coordination of simplification and commercial standards programs with particular reference to the needs of an industry."

SOUTHERN DIVISION CONFERENCE

(Continued from page 272)

RESOURCES PUBLICATION

WHEREAS the American Mining Congress has recognized officially the merit of the undeveloped mineral resources of the South as being capable of economic development and has commended these resources to the mining industry of the Nation, in order that home industry might be stimulated, rather than our interests be scattered in foreign lands, for the purpose of bringing imported minerals to this country; and

WHEREAS this conference recognizes with gratitude the value to the South of the service which the American Mining Congress through its engineering staff, headed by Dr. Henry Mace Payne, has rendered this region; and

WHEREAS this conference feels the need of capable and safe leadership in promoting development of mining and allied industries within these states, and must rely on this Congress to aid in formulating a constructive program designed to stimulate interest along those lines among our citizens, as well as among investors and developers from outside; and

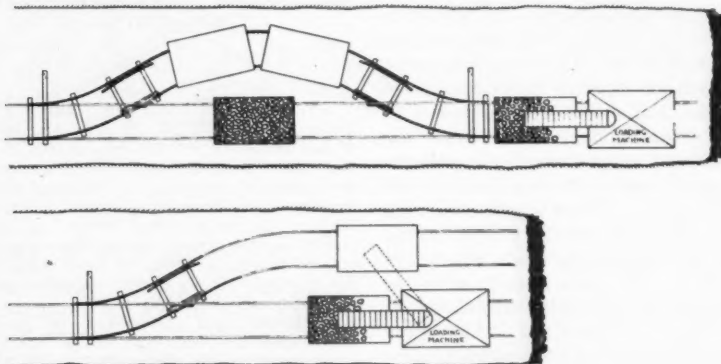
WHEREAS we realize that up to this point the South has contributed but little in service or money to relieve the burden involved in this important movement, although we recognize that if the mineral resources of the South are to be speedily developed we of the South must render reciprocal support: Therefore be it

Resolved, That this, the Third Industrial Development Conference, pledges the moral and financial support of the people and correlated business interests and public service interests of each of the states participating, so far as within our power, to bring the same about to advance such plans and programs as the American Mining Congress and its Board of Directors of the Southern Division may see fit to adopt for promoting southern mining and industrial development, and that the board have power to adopt such plans and rules as may be deemed expedient for most effectively carrying out of its program.

WITH THE MANUFACTURERS

Portable Turnout Placed on Market By West Virginia Rail Co.

To meet the demand for track equipment that will afford an adequate supply of cars to the modern loading machine, the West Virginia Rail Company, of Huntington, W. Va., according to a recent statement from them, has developed and placed on the market a type of portable siding or turnout that permits of its easy placement at points that are best suited to serve the loading machine with cars. The device is likewise well adapted for installing temporary turnouts, such as on tracks through crosscuts, etc.



Portable turnout as used with loading machine

"The turnout can be installed on any track without cutting or bending the original track rails," according to the company. "It interferes in no way with operations on the main track, and traffic passing along this track does not come in contact with the turnout.

"The function of this turnout when used in connection with machine loading is to give the advantage of two tracks in the room, one for empty cars and one for loaded cars, without the labor and expense of laying the two tracks the full length of the rooms. One track is laid in the room and advanced to the face in the usual manner on steel or wood ties. The portable turnout is used to give two open-end tracks at the face or a passing siding a short distance from the face, depending upon the type of loader and the preferred method of handling cars.

"The loading machine running either on the track on standard wheels or on the track on caterpillar belt can pass over the turnout with no interference. The turnout is advanced to close proximity

to the face at suitable intervals, it being so made that little labor or time is necessary for its moving.

"To move the siding it is only necessary to drive the clips on the ties to loose position with a hammer, drive out wedge and disconnect the switch bar. The parts may then be picked up, the ties slipped under rail in their new position, the parts laid down and wedge driven in place.

"Many of these turnouts are now in successful use with different type of loaders, such as the Joy and Coloder, and with both motor or mule haulage.

Westinghouse Announces New 200 Ampere Arc-Welder

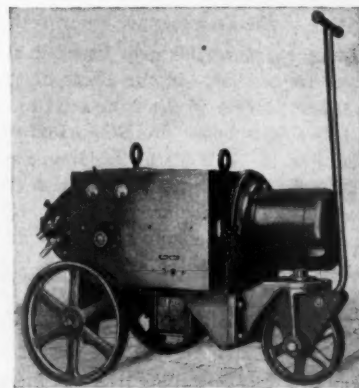
A new Westinghouse, 200 ampere, single-operator welding set has been designed to meet every requirement in both the shop and field, and to serve all applications, within its rating, with speed and economy. This new unit is outstanding in its features of simplicity of operation and compactness in construction.

The set is started by connecting directly across the line by means of a line-starter and linestart motor. Starting and stopping are accomplished by the simple operation of a pushbutton. A single rheostat varies the arc current over the entire welding range. Accurate adjustment over the welding range, from 60 amperes to 300 amperes, is afforded by steps of 5 amperes.

The motor-generator, and control equipment are assembled in a totally enclosed frame. The exciter, which is

overhung from the motor end, is securely fastened to the unit frame. This type of construction guards the operator against injury, and protects the set from dirt and falling objects. In performance tests welding operations have been carried on while the sets were suspended at every angle that could possibly be required in any application. Operation is as satisfactory when the set is placed on end, as when it is in the normal position.

Steady welding current, insuring thorough penetration and fusion of the weld, is obtained from a constant current generator. A separate exciter is used in all Westinghouse single-operator welders. It insures a high speed of welding and a machine whose generator voltage responds to any changes in arc conditions, this tending to maintain a constant rate of fusion of the electrode.



The new 200-ampere arc welder

The unit is rated at 200 amperes, 1 hour, 50° rise on a resistance load at 25 volts which conforms to the standard rating of the National Electrical Manufacturers Association. The motor is wound for 220 or 440 volts and is assembled with the necessary connections made for operation from a 3-phase 60 cycle circuit. If it is desired to operate the unit from a 440 volt, 3-phase, 60 cycle circuit, it is only necessary to replace the operating coil on the magnetic starter, and to reconnect the motor leads.

Motors for Gaseous Mines

Direct-current motors with starting switches, designed to meet the requirements of the U. S. Bureau of Mines for equipment permissible for use in gaseous mines, have been developed by the General Electric Company and are offered in one, three, and five horsepower ratings. These equipments are for use on mine pumps, room conveyors, and for similar applications where constant-



One-horsepower motor.

speed direct-current motors are suitable. These motors and starters, when included in an assembly of elements submitted for approval to the Bureau of Mines, will not themselves need to be tested in an explosive mixture, since they have already met the requirements of such tests; but the approval plate can be applied only when the whole assembly has been approved, which is in accordance with the bureau's established practice. The new equipment has been given the General Electric designation "Class BM."

Motors and starters are totally enclosed, the object being to prevent any heat generated inside the apparatus from any cause whatever from being transmitted to the outside in such intensity as to ignite any gases surrounding the equipment. The three ratings are all 1150 r.p.m., 230-volt, compound-wound, constant-speed machines. The motors are suitable for geared, belted, or direct-connected service, and can also be supplied for 500-volt service, with shunt or compound winding. They will carry their rated load continuously without exceeding 75 deg. C. rise when operating in an ambient temperature of 40 deg. C.

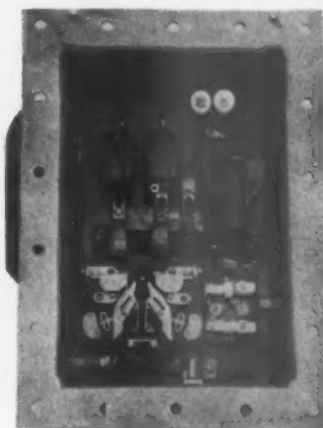
Frames and end shields are of totally enclosed construction. Wide machined flanges are provided at all joints and also at the point where the shaft passes through the bearing housing. All bolt holes are bottomed in metal, so that the accidental omission of any bolt will not leave an opening into the interior of the motor.

The end shields are of heavy construction with radial ribs on the outside, these providing increased radiating sur-

face and additional strength. Ball bearings of the cartridge type are provided at both ends of the motor. This construction makes it possible to remove the end shields without the necessity of removing the ball bearings, and in addition readily permits sufficient extension of the bearing housing along the shaft to maintain a liberal cooling surface for gases passing between the housing and the shaft.

For adjustment of the brushes and inspection of the commutator and brushes, openings are provided in the end shield at the commutator end of the motor, these openings being closed by a hand hole plug which screws into the hole. Holes in the plugs are provided through which a wire sealed with a lead seal can be threaded, thus sealing the plugs.

Motor insulation is of the fire-resisting type. Brush holders are readily accessible through the inspection holes. Suitably covered outlets for the motor leads are provided and can be supplied to accommodate rubber hose conduit, rigid steel conduit or trailing cable. For the last type, a bellmouth outlet is used and a clamp is provided to take all strain off the terminals. The bolts holding the cover for the terminals are sealed by sealing wire.



Control box with cover removed

The starting switch consists of a double-pole, magnetic contactor mounted on a small panel with a "start" and "stop" control switch and a temperature overload relay. The panel is enclosed in a heavy sheet steel box. The cover is provided with a suitable handle and is bolted to a wide flange on the box by a large number of closely spaced bolts provided with lock washers and threaded with sealing wire. The wide flanges are suitably proportioned to cool any gases escaping from the interior. Both the incoming and the outgoing leads pass through packing glands and the outlets

are available to accommodate rubber hose conduit, rigid steel conduit or trailing cable. The trailing cable type of outlet is provided with bellmouth and clamp as previously described. Terminals outside the switch box are provided for the incoming lines. They are protected by a suitable conduit terminal cover attached by bolts which are sealed by a sealing wire.

A handle on the outside of the switch box, with positions for "start" and "stop" suitably indicated, operates the control switch inside which, in turn, opens or closes the contactor. When the contactor is closed the motor is connected directly across the line at full voltage.

The temperature overload relay provides overload protection on both sides of the line. The two heating elements, one for each side of the line, are in the motor circuit and have a heating characteristic similar to that of the motor itself. The relay can be reset by hand, by means of a push button extending through the switch case. Undervoltage protection is also provided, the motor being automatically disconnected from the line, not to restart until the starting lever is moved to the proper position.

Simons Paint Spray Brush

The Simons Paint Spray Brush Co., Dayton, Ohio, has developed a spray gun for painting, which operates at a very low pressure, thus enabling the operator to have complete control of the disposition of the paint. This gun will do the work of three or four men, and, it is claimed, will save about 30 percent of the paint. It is of especial advantage in painting bridges, standpipes, elevated tanks, machinery, municipal buildings and motor vehicles. When used with kerosene and about 70 lbs. air pressure, it is especially handy for cleaning motors, engines, machinery and equipment prior to painting. The Simons Paint Spray Brush Co. also manufactures an oil and water separator, which is claimed to eliminate troubles due to oil and condensed water passing through the air line.

New Commutator Stones

The Martindale Electric Co., 1260 West Fourth Street, Cleveland, Ohio, announce their new "Double Duty" commutator stones for touching up commutators and slip rings.

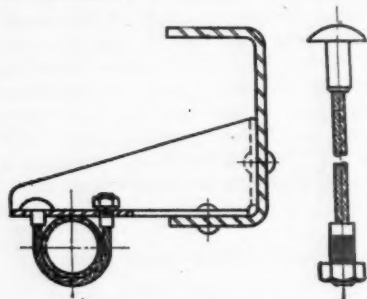
One end is made from their coarse (cutting) grade and the other end from their fine (finishing) grade.

These stones are furnished in various sizes convenient for carrying in the pocket or tool kit.

American Cable Co. Develops a Flexible Bolt

Through the development of the pre-formed type of wire rope which makes possible the attachment of fittings by the processing method that compels the fitting to become an integral part of the rope, the American Cable Co. has recently perfected the Tru-Lay-Tru-Loc flexible bolt illustrated by the accompanying line drawing.

These new bolts may be used in countless places in and around the plant or mill or in any place where rigid U bolts are impracticable. They are finding ready acceptance as auxiliary hangers for power shafts, suspension brackets for overhead steam or water piping, shackle bolts for temporary wall boxes, tanks, etc., for scaffolding and tackle, on various parts of machinery, and in other places where semi-flexible connections are necessary.



The principle on which the new flexible bolt rests is the preformed type of wire rope. Preforming the wires and strands to the exact helical shape they must assume in the completed rope results in a cable that does not require seizing but may be cut like a rod. This type of rope permits a close fitting attachment to be slipped over the unseized end of the rope and to be processed so that the steel of the fitting cold flows into the interstices of the rope and thus becomes practically an integral part thereof. Naturally such fittings can be threaded for a nut or capped for a head. The flexible bolt which has resulted from these developments is available in varying lengths.

Bethlehem Makes Improvements in Steel Ties

Bethlehem Steel Co. has recently made two important improvements in their steel ties. One of these is the use of a long, rolled steel clip in place of the two hook head buttons formerly used for fastening the rails in place. These clips are now standard on all ties.

The strength of the ties has also been increased by putting reinforcing flanges and bulbs on the legs of the section.

These improvements give increased strength, life and serviceability.

A Portable Lighting Unit

A portable acetylene flare light has been added to the line of the Oxweld Acetylene Co., 30 East 42nd St., New York City. This flare light is extremely powerful and has many outstanding advantages as a portable lighting unit.

The fuel used is acetylene, produced from carbic. This material is in the form of cakes of uniform size and cylindrical shape. Several cakes of carbic, enough to operate the flare continuously for 12 hours, can be placed in the light at one charging. If the use of the light is discontinued before the entire charge is used, the portion remaining can be left in the holder, or, being dry, solid and clean, can be slipped back into the drum for later use. The operating cost of this light per hour of service is very low.

Construction is extremely rugged and simple. There are but three parts, and these can not be incorrectly assembled. Charging is a one-man job which requires only a few minutes. When the light has been put into operation it needs no further attention until the charge is exhausted.

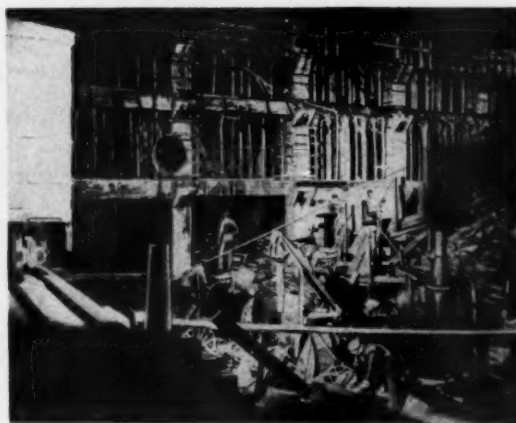
In case the light is accidentally upset, the water runs out of the container and gas generation stops immediately. This light, because of its power and dependability, is suitable for subway and tunnel operations and night work of all kinds including stock piling, excavating, building construction, paving, loading cargo aboard ship, and harvesting ice.

Carbic flare lights are manufactured by the American Carbolite Co., Inc., and Oxweld Acetylene Co., New York City, are sole distributing agents. Carbic, the fuel used, is marketed exclusively through Union Carbide Sales Co., New York City. Both products are handled by jobbers in principal cities.

The carbic light is available in several styles, each of which is entirely self-contained. They range in size from the 8,000 candle-power "Standard" model, which weighs 36 lbs. empty and 115 lbs. charged and stands 6 ft. 7 in. high with reflector raised, to a hand light. A double burner model, which will furnish illumination in two directions simultaneously, is furnished in about the same size as the "Standard" model.

Rock Drill Literature

Ingersoll-Rand Co., 11 Broadway, New York City, has just published several new bulletins describing its various rock drills. These bulletins, which are printed in two colors, are all of the 8½ by 11



The portable lighting unit

size—a feature which makes for ease of reading and handling.

The bulletins cover Ingersoll-Rand drifter drills, wagon drills, "Little Tugger" hoists, and drill steel sharpeners. Copies of these bulletins, nicely bound in an embossed cover, will be sent to anyone interested.

A brief summary of each booklet is given below.

Bulletin 4063, Drifter Drills

This is a 32-page catalogue describing in detail the 125-lb. N-72, the 164-lb. R-72, and the 208-lb. X-72 drills.

The introduction, which is entitled "The Evolution of the Rock Drill," gives a brief history of the development of drills and also shows a line drawing of the first percussion drill ever made (1849).

The bulletin is well illustrated, containing several full-page views of the drills in operation under various drilling conditions. There are also close-up and sectional views showing details of the drills themselves. The bulletin is divided into chapters on mining, tunneling, and quarrying. Under each of these headings are the recommendations of Ingersoll-Rand Company covering proper drill for each kind of work.

Bulletin 4072, Wagon Drill

This four-page bulletin contains interesting performance data on the wagon drills as used in crush-stone quarries. It describes both the large and small models.

Bulletin 4159, "Little Tugger" Hoists

Besides a description of the three sizes of "Little Tugger" hoists now manufactured, this bulletin devotes some 16 or 18 pages to the "Various Types of Scrapers, Slides, and Methods of Mining to which the 'Little Tugger' is being applied." One or more of the systems illustrated can be applied to almost any of the mining methods now in use, and

the bulletin should prove especially interesting wherever "slushing" is used or wherever "slushing" can be profitably applied.

Bulletin 4422—Drill Steel Sharpeners

This bulletin is the most impressive of the entire group. Like most of the others in the series, it has 32 pages and is well illustrated with cuts showing the details of various important parts, such as the crosshead, crosshead rod, piston, etc.

The introduction is unusually interesting, outlining the 20 years of pioneering in sharpener construction and the reasons for the heavy design.

Included in the bulletin is a two-page drawing of a "Practical Blacksmith Shop." Ingersoll-Rand Company informs us that this layout was made by its engineers as a result of numerous inquiries from mine and quarry operators. It is an excellent layout of sharpener equipment for a modern, up-to-date shop.

Pot-Type Electric Furnaces for Lead Hardening

General Electric announces an addition to its line of electric heating equipment in the form of a pot-type electric furnace for lead hardening, designed to operate at temperatures up to 1,650 deg. F. It is being marketed in four sizes.

This furnace, the manufacturers claim, consumes less current than any other pot-type furnaces of similar size and capable of doing the same work. It utilizes the standard method of submerging the work in a bath of molten lead, and is particularly suitable for hardening and tempering chisels, files, drills, taps, dies and other small tools or parts entering into the manufacture of a high-grade finished product.

The four sizes now in manufacture cover a wide range of production conditions and are suited to a multiplicity of applications. The smallest has a maximum capacity of 75 pounds of steel per hour at 1,500 deg. F., an inside pot diameter of 8 inches and depth of 12 inches, and an overall diameter of 32 inches and working height of 32 inches. The largest size has a maximum capacity of 250 pounds of steel per hour at 1,500 deg. F.; inside dimensions are 16 inches, diameter, and 24 inches, depth; working height is 45½ inches, and outside diameter, 46¼ inches.

In explanation of the small current consumption of this furnace, the manufacturers call attention to the construction, the inner melting pot not extending over the top of the furnace. As a result, very little heat is lost by being conducted out by the pot.

Sullivan Vertical Air Compressors

For shop, power plant, and miscellaneous industrial requirements in which a relatively small amount of compressed air is needed, and where compactness, continuous operation, and practically automatic control are important factors, the Sullivan Machinery Co. has designed recently, two new vertical direct motor-driven air compressors of the two-cylinder and four-cylinder types. These machines are intended for small plants or shops where air requirements are not large, or for use in large installations in which isolated departments need air, where the distance from the main compressor plant is considerable, or for standby or night service when it is desired to save operating costs by shutting down the main compressor unit. Both machines are single acting and similar in design to the portable air compressor units made by this company.

The four-cylinder vertical compressor is a new departure in design. Instead of using two large cylinders this model employs four of a proportionately smaller size. The cylinders are placed in pairs at an angle of 90 degrees with each other, forming a V-type arrangement. As the two connecting rods for opposite cylinders attach side by side on one crankpin, only two cranks are required for the four cylinders. The shaft is but slightly longer than that used in a conventional two-cylinder machine and requires the same number of bearings for its support. The light weight of the reciprocating parts and the V-type arrangement has reduced to a minimum the forces causing vibration.

These two machines are described more fully in Bulletin 83-H, copies of which may be obtained from the company at 122 South Michigan Avenue, Chicago, Ill.

International Nickel Bulletins

The following publications issued by the International Nickel Company, 67 Wall Street, New York, may be obtained upon request to the company:

Roller Bearings in Railroad Service—Performance records of the Chicago, Milwaukee & St. Paul Railroad heavy limited trains equipped with roller bearings and details of improvements in operation secured with savings effected by their use.

Nickel Alloy Steels for Roller Bearings—Details of construction of nickel alloy steel roller bearings carrying heavy loads at high speeds with tables showing the physical properties required of the materials used to meet this severe service.

"The Story of Combustion"

So many people have commented on "The Story of Combustion" recently published in *World's Work* that the International Combustion Engineering Corp. have had this article reprinted. This article describes the amazing progress which has taken place in this important field of engineering during the past decade. Copies may be obtained from International Combustion Engineering Corporation, Madison Avenue at 35th Street, New York City.

Rollway Bearing Catalogs

The Rollway Bearing Co. has issued recently a new "Catalog 4-A" on their wide series and utility type of bearings and also a number of bulletins as follows:

Bulletin No. 53—Self-Aligning Pillow Blocks equipped with Rollway Adapter Type Bearings to fit Standard Commercial Shafting.

Bulletin No. 54—Various Precision types of Rollway Radial Bearings.

Bulletin No. 55—Self-Aligning Pillow Blocks equipped with Standard Rollway Bearings.

Bulletin No. 56—Large Rollway Bearings in the recently adopted International sizes.

Copies may be obtained from the company at Syracuse, N. Y.

Appoints Representative

The Magnetic Mfg. Co. has appointed T. F. Scannell as exclusive representative on complete line of magnetic separation equipment, magnetic clutches for power transmission, etc. Mr. Scannell's office will be located at 502 Ambassador Building. Mr. Scannell was formerly connected with the Chain Belt Co., of Milwaukee.

G. E. Suggestion Awards

The General Electric Co. awarded \$51,567 to 4,913 of its employees during 1927 for their suggestions tending to improve working conditions or increase the efficiency of the company's operations. During the year 15,059 suggestions were offered, an increase of 500 over the previous year, and more than 32 percent were accepted.

Recently issued catalogues of the General Electric Company are the following: "Type BTA Motors, adjustable speed, a. c., brush shifting"; "G-E Pot-type Electric Furnaces," for lead hardening; "Electric Drive for Coal and Ore Hoists"; "G-E Motor Drives for Centrifugal Pumps in Coal and Metal Mines"; "G-E Mine Fan Equipment."

Allis-Chalmers Appointment

Allis-Chalmers Mfg. Co., Milwaukee, announces the appointment of R. T. Stafford, formerly district manager of the Seattle office, as assistant manager of the Electrical Department in Charge of Sales and Engineering at Pittsburgh Transformer Works.

John Alberts, of Seattle office, has been appointed district manager, succeeding Mr. Stafford. The Seattle district embraces the States of Washington and Oregon, having a branch office located at Portland.

The company has announced that E. D. Hill will be located at 42 Church Street, New Haven, Conn. This will enable the company to more effectively serve this community in connection with motors, pumps and Texrope drives. The sales will be under the direction of A. F. Rolf, manager, Allis-Chalmers New York office, 50 Church Street.

Morse Chain Company

T. M. Manley, who has served in various capacities for the Morse Chain Co. for about 20 years, has recently been appointed manager of the district including the Mohawk Valley, northern New York, Vermont, western Massachusetts and northeastern Pennsylvania. Mr. Manley's headquarters are at Ithaca, N. Y., the main office and works of the Morse Chain Co.

"Recent Development in Steam Generators"

A paper entitled "Recent Developments in Steam Generation" was presented before the Engineers' Society of Western Pennsylvania at Pittsburgh on January 17 by Mr. George T. Ladd, president of the Ladd Water Tube Boiler Company. This paper summarizes the important developments that have occurred in the field of steam generation during the past decade, and discusses present trends. Its scope is extended to include such developments as low-temperature carbonization of coal and dry quenching of coke. It is an authoritative treatise which will undoubtedly be of interest to all engineers whose work is related in any way to power-plant operations.

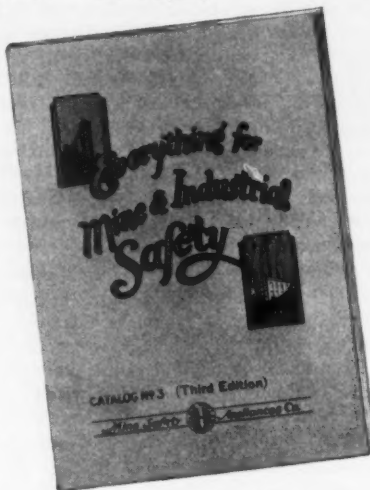
Copies will be sent to those interested upon request to the Combustion Engineering Corporation, 200 Madison Avenue, New York City.

"Rotary Car Dumpers," a 12-page bulletin just issued by Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill., may be had from the company by asking for Bulletin No. 103.

New M. S. A. Catalog

The Mine Safety Appliance Co., Pittsburgh, Pa., has recently issued a revised edition of Catalogue No. 3, "Everything for Mine and Industrial Safety." The catalogue consists of 135 pages profusely illustrated and shows a number of new mining and industrial appliances, including the Edison Electric Safety Cap Lamps, Models F and G.

Copies may be had gratis upon application to the company.



New "S-A" Engineering Offices in Canada

Following the establishment of a complete manufacturing plant at Belleville, Ontario, the Stephens-Adamson Mfg. Co., of Canada, Limited, has opened branch sales engineering offices at Toronto, Ontario, and Montreal, Quebec.

The establishment of these offices follows a successful sales policy for extension which has proven so satisfactory in the United States organization.

The Toronto, Ontario, office is located in the Bank of Hamilton Building, with Mr. A. F. White in charge. Mr. George H. Smith is in charge of the Montreal, Quebec, office, located in the New Birks Building. Both of these men are engineers of ability and have had experience with conveying machinery which enables them to render valuable assistance to manufacturers throughout Canada.

Secretary of G. E. Retires

Myron F. Westover, secretary of the General Electric Co. for the past 34 years, retired on March 1 and William W. Trench, assistant secretary, has been elected by the board of directors to succeed him.

Mr. Westover has been actively identified with the electrical industry for 40 years.

Mr. Trench, the new secretary, is a native of Staten Island. He is 36 years of age, a graduate of St. Lawrence Uni-

versity, the Brooklyn Law School and was admitted to the bar in 1916.

On March 15, 1928, the branch sales office and factory of the Carbon Sales Division of National Carbon Co., Inc., moved from its former location at 357 West 36th Street, New York City, to new and much larger quarters at the company's plant at Fourteenth and Henderson Streets, Jersey City, N. J. The company states that this change more than doubles the size of the former plant and that considerable additional manufacturing equipment has been added to meet the increasing demand for its brushes and carbon products in the eastern district territory.

Robert J. Deneen and Frederick Attwood were elected vice presidents of the Ohio Brass Co. at a meeting of the board of directors held February 7, 1928.

Mr. Deneen is in charge of the company's sales activities in the Chicago district, and Mr. Attwood is in New York in charge of the eastern sales district.

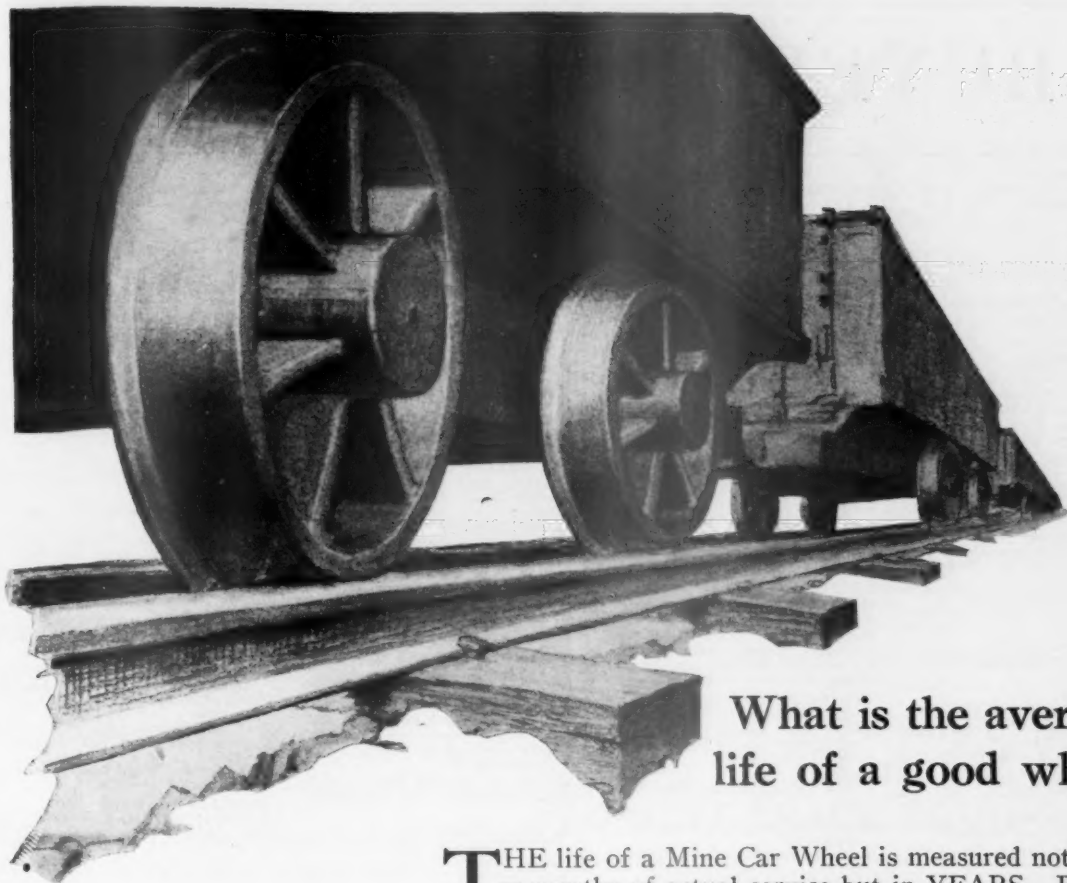
The Mine Safety Appliance Co., Braddock Avenue and Thomas Boulevard, Pittsburgh, Pa., have announced recently the new M. S. A. type 65 rock dust distributor, a small, compact machine for the application of rock dust in coal mines. A descriptive bulletin is available.

A new note in connection with safety and haulage costs is emphasized in the latest bulletin of the Atlas Car & Manufacturing Co., of Cleveland, entitled "Atlas Permissible Storage Battery Locomotive." Copies of this bulletin (No. 1232) may be obtained by addressing the company.

The new line-start induction motors recently put on the market by Allis-Chalmers Manufacturing Co., Milwaukee, Wis., are described in a bulletin (No. 1143) recently issued by the company.

Another bulletin, No. 1118-E, covers types AR and ARY Polyphase induction motors. This bulletin describes both the slip and roller-bearing types and in standard horizontal and vertical construction.

"Ajax-Northrup Electric Furnaces" is the title of a new bulletin (No. 5) just issued by the Ajax Electrothermic Corporation, Trenton, N. J., describing their motor generator type furnaces and equipment. This furnace is exciting increasing interest in the metal industry both here and in Europe. Smaller furnaces operated from oscillators or spark-gap converters are covered in bulletin 4 of the company.



What is the average
life of a good wheel?

*In the
long run*

THE life of a Mine Car Wheel is measured not in weeks or months of actual service but in YEARS. Because of this long endurance the date of purchase is frequently forgotten; records are lost; operating personnel may have changed.

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run the best!*



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Oxweid Acetylene Co., 30 E. 42d St., New York City.

ACID, SULPHURIC
Irvington Smelting & Refining Works, Irvington, N. J.

AERIAL TRAMWAYS
American Steel & Wire Co., Chicago and New York.

AFTERCOOLERS (Air)
Ingersoll-Rand Co., New York City.

AIR COMPRESSORS
Ains-Unamers Mfg. Co., Milwaukee, Wis.

Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.

AIR COMPRESSOR OILS
Standard Oil Co. (Ind.), Chicago, Ill.

AIR FILTERS—Bag type
American Coal Cleaning Corp., Welch, W. Va.

AIR HEATERS
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

AIR ROSE COUPLINGS
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

AIR LIFT PUMPING
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

ALL SERVICE GAS MASKS
Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

ANEMOMETERS
Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

ANNUNCIATOR WIRES & CABLES
John A. Roebling's Sons Co., Tren-ton, N. J.

ANNUNCIATOR WIRES & CABLES, INSULATED
American Steel & Wire Co., Chi-cago, Ill., and New York.

ANTI-RUST OILS & GREASES
Standard Oil Co. (Ind.), Chicago, Ill.

ARMATURE COILS & LEADS
General Electric Co., Schenectady, N. Y.

John A. Roebling's Sons Co., Tren-ton, N. J.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

ARMORGRIDE
Hendrick Mfg. Co., Carbondale, Pa.

General Electric Co., Schenectady, N. Y.

ASPIRATORS
American Coal Cleaning Corp., Welch, W. Va.

AUTOMATIC CAR & CAGER STOPS
Mining Safety Device Co., Bower-stand, Ohio.

AUTOMATIC CAR CAGES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

Roberts & Schaefer Co., Chicago, Ill.

AUTOMATIC CAR DUMPERS
Roberts & Schaefer Co., Chicago, Ill.

AUTOMATIC FLAGGING SIGNALS
American Mine Door Co., Canton, Ohio.

AUTOMATIC (Mine Doors, Trucks and Electric Switches)
American Mine Door Co., Canton, Ohio.

AUTOMATIC MINE SWITCHES
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

AUTOMATIC SWITCH

THROWERS
American Mine Door Co., Canton, Ohio.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

AUTOMOBILE CABLES
John A. Roebling's Sons Co., Tren-ton, N. J.

BAG TYPE AIR FILTERS
American Coal Cleaning Corp., Welch, W. Va.

BALLAST UNLOADER ROPES
John A. Roebling's Sons Co., Tren-ton, N. J.

BALL BEARINGS
S K F Industries, 40 E. 34th St., New York City.

BALL & ROLLER BEARINGS
S K F Industries, 40 E. 34th St., New York City.

BAR, STEEL CO.
Carnegie Steel Co., Pittsburgh, Pa.

Timken Roller Bearing Co., Canton, Ohio.

BATTERIES, Blasting
Hercules Powder Co., Wilmington, Del.

BATTERIES, DRY (for Bells, Buzzers, Signals, Blasting)
National Carbon Co., Inc., 30 East 42nd St., New York City.

BATTERIES (Storage, Gas Welding, Cutting, Dissolved Acetylene)
Prest-O-Lite Co., 30 East 42d St., New York City.

BEARINGS
S K F Industries, 40 E. 34th St., New York City.

BEARINGS (for all kinds of equipment)
Hyatt Roller Bearing Co., Newark, N. J.

BEARINGS, ANGULAR CONTACT
S K F Industries, New York City.

BEARINGS, ANTI-FRICTION
S K F Industries, New York City.

BEARINGS, ARMATURE
S K F Industries, New York City.

BEARINGS, AUTOMATIC
S K F Industries, New York City.

BEARINGS, BALL
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BEARINGS, JOURNAL, CAR & LOCOMOTIVE
S K F Industries, New York City.

BEARINGS, MOTOR, ELECTRIC
S K F Industries, New York City.

BEARINGS RADIAL
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, ROLLER
S K F Industries, New York City.

BEARINGS, SHAFT, SELF-OILING
S K F Industries, New York City.

BEARINGS, TAPERED ROLLER
Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, THRUST
S K F Industries, New York City.

Timken Roller Bearing Co., Canton, Ohio.

BELL CORD
John A. Roebling's Sons Co., Tren-ton, N. J.

BELT DRESSING
Standard Oil Co. (Ind.), Chicago, Ill.

BELTING (Conveyor, Elevator, Transmission)
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

BELTING, SILENT CHAIN
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

BELTS, Miners' Safety
Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

BINS (Coke and Coal)

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

BIT BOXES
Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

BITS, Carbon (Diamonds) for Core Drill
R. S. Patrick, Sellwood Building, Duluth, Minn.

Diamond Drill Carbon Co., World Bldg., New York.

BITS, Diamond Drilling
R. S. Patrick, Sellwood Building, Duluth, Minn.

BIT SHARPENERS
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

Ingersoll-Rand Co., 11 Broadway, New York City.

BLACK DIAMONDS
Diamond Drill Carbon Co., World Bldg., New York.

R. S. Patrick, Sellwood Building, Duluth, Minn.

BLACK OILS
Standard Oil Co. (Ind.), Chicago, Ill.

BLASTING CAPS
Hercules Powder Co., Wilmington, Del.

BLASTING DEVICES
Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

BLASTING MACHINES
Hercules Powder Co., Wilmington, Del.

BLASTING POWDER
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.

Hercules Powder Co., 934 King St., Wilmington, Del.

BLASTING SUPPLIES
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.

Hercules Powder Co., 934 King St., Wilmington, Del.

BLASTING UNITS (Dry Battery)
National Carbon Co., Inc., 30 East 42nd St., New York City.

BLOCKS, PILLOW
S K F Industries, New York City.

BLOWERS, CENTRIFUGAL
American Coal Cleaning Corp., Welch, W. Va.

General Electric Co., Schenectady, N. Y.

Ingersoll-Rand Co., 11 Broadway, New York City.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Robinson Ventilating Co., Zellen-ople, Pa.

BLOWERS (Turbine)
Robinson Ventilating Co., Zellen-ople, Pa.

BLOWPIPES, Brazing, Carbon Burning, Cutting, Lead Burning, Welding, Welding and Cutting
Oxweid Acetylene Co., 30 E. 42d St., New York City.

BLUE CENTER STEEL WIRE ROPE
John A. Roebling's Sons Co., Tren-ton, N. J.

Phillips Mine & Mill Supply Co., Pittsburgh, Pa.

BOND TERMINALS
American Mine Door Co., Canton, Ohio.

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R. S. Patrick, Sellwood Building, Duluth, Minn.

Diamond Drill Carbon Co., World Bldg., New York.

BRACES, GAUGE

Central Frog & Switch Co., Cincin-nati, Ohio.

BRACES, RAIL
Central Frog & Switch Co., Cincin-nati, Ohio.

BRACES, TRACK
Central Frog & Switch Co., Cincin-nati, Ohio.

BRAZILIAN ROCK CRYSTAL
Diamond Drill Carbon Co., World Bldg., New York.

BREAKER MACHINERY
American Rheolaveur Corporation, Wilkes-Barre, Pa.

Vulcan Iron Works, Wilkes-Barre, Pa.

BREAKERS
American Coal Cleaning Corp., Welch, W. Va.

BREAKERS (Construction and Machinery)
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

BREAST MACHINES
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

BRIQUETTING MACHINERY
Vulcan Iron Works, Wilkes-Barre, Pa.

BRUSHES (Carbon, Graphite and Metal Graphite for Electric Motors, Generators and Con-verters)
National Carbon Co., Inc., Cleve-land, Ohio, and San Francisco, Calif.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

BUCKETS (Elevator)
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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

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Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

BURRELL, Gas Indicators, Gas Masks, Mine Air Analyzer
Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

CABINETS, First Aid, Industrial Miners' No. 9
Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

CABLE COMPOUNDS
Standard Oil Co. (Ind.), Chicago, Ill.

CABLE GREASE
Keystone Lubricating Co., Phila-delphia, Pa.

CABLES
American Steel & Wire Co., Chi-cago and New York.

Roebling's Sons Co., John A., Tren-ton, N. J.

CABLES (Connectors and Guides)
American Mine Door Co., Canton, Ohio.

CABLES, INSULATED
General Electric Co., Schenectady, N. Y.

John A. Roebling's Sons Co., Tren-ton, N. J.

CABLES, SUSPENSION BRIDGE
John A. Roebling's Sons Co., Tren-ton, N. J.

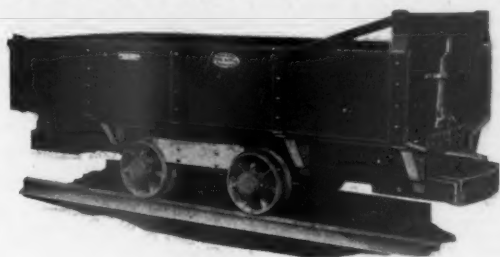
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S. Flory Mfg. Co., Bangor, Pa.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

CAGE DUMPERS, ROTARY
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CAGES (Safety Appliances)
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Pittsburgh, Pa.



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The expense of installing a good track system is soon absorbed in the speeding up of output, in the freedom from costly derailment delays and in power saved. Let our experienced engineers work with you when planning your next track improvements. We are prepared to make prompt shipments from stock.

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CENTRAL MINE TRACK EQUIPMENT

SWEET'S STEEL MINE TIES



**They're easy to install—
They wear longer—
They save time and labor—**

**YOUR MINERS PREFER THEM—
MAY WE SEND OUR CATALOG?**

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WILLIAMSPORT, PENNA.

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More than twenty years of scientific experimenting and practical experience are embodied in Enterprise Car Wheels and Mine Trucks. All these years of experiment and experience are represented in a finished product that we are proud of.

Not only the best of raw material and precise workmanship goes into the making of Enterprise Wheels, but engineering and manufacturing ability as well. Scientific knowledge has been applied to every process of our casting and machine work until we have perfected a truck on which we give a five-year guarantee bond.

We claim as a result of these years of painstaking research and experimenting that we have perfected a car that is superior in smoothness, reliability and economy. It behooves every mine owner who is in need of underground transportation to investigate Enterprise Mine Cars and Trucks. The excess value is so obvious and the life and performance of these cars so remarkable that we solicit the most thorough scrutiny of our claims of superiority.



We will have a booth at the Cincinnati Exposition in May. A cordial welcome awaits you by our representatives.

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Roberts & Schaefer Co., Chicago, Ill.

CAGERS, AUTOMATIC

Mining Safety Device Co., Bowerston, Ohio.

Phillips Mine & Mill Supply Co., Pittsburgh, Pa.

Roberts & Schaefer Co., Chicago, Ill.

CAGERS, AUTOMATIC & MANUAL

Mining Safety Device Co., Bowerston, Ohio.

Roberts & Schaefer Co., Chicago, Ill.

CAGES

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Connellville Mfg. & Mine Supply Co., Connellville, Pa.

Diamond Machine Co., Monongahela, Pa.

Vulcan Iron Works, Wilkes-Barre, Pa.

CAGES (Self-dumping)

Roberts & Schaefer Co., Chicago, Ill.

Vulcan Iron Works, Wilkes-Barre, Pa.

CALCINERS

Vulcan Iron Works, Wilkes-Barre, Pa.

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R. S. Patrick, Sellwood Building, Duluth, Minn.

CARBON FOR DIAMOND DRILLING

Diamond Drill Carbon Co., World Bldg., New York.

R. S. Patrick, Sellwood Building, Duluth, Minn.

CARBON BURNING APPARATUS

Oxweld Acetylene Co., 30 E. 42nd St., New York City.

CARBON ELECTRODES (for Electric Furnaces and Electrolytic Work)

National Carbon Co., Inc., Electrode Sales Division, 30 East 42nd St., New York City.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CARBON MONOXIDE DETECTOR

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Roberts & Schaefer Co., Chicago, Ill.

CAR DUMPERS (Rotary)

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Phillips Mine & Mill Supply Co., Pittsburgh, Pa.

Roberts & Schaefer Co., Chicago, Ill.

CAR FEEDERS

Mining Safety Device Co., Bowerston, Ohio.

Roberts & Schaefer Co., Chicago, Ill.

CAR HAULS

Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

Hockensmith Wheel & Mine Car Co., Penn., Pa.

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Roberts & Schaefer Co., Chicago, Ill.

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S. Flory Mfg. Co., Bangor, Pa.

Roberts & Schaefer Co., Chicago, Ill.

CAR RETARDERS

Mining Safety Device Co., Bowerston, Ohio.

Roberts & Schaefer Co., Chicago, Ill.

CARS OF ALL DESCRIPTION

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Hockensmith Wheel & Mine Car Co., Penn., Pa.

CAR STOPS, AUTOMATIC & MANUAL

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Roberts & Schaefer Co., Chicago, Ill.

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American Steel & Wire Co., Chicago, Ill., and New York.

John A. Roebling's Sons Co., Trenton, N. J.

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Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Timken Roller Bearing Co., Canton, Ohio.

CASTINGS, GRAY IRON

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Vulcan Iron Works, Wilkes-Barre, Pa.

CASTINGS, OPEN HEARTH STEEL

Vulcan Iron Works, Wilkes-Barre, Pa.

CASTINGS (steel, iron)

Vulcan Iron Works, Wilkes-Barre, Pa.

CAST STEEL FROGS

Central Frog & Switch Co., Cincinnati, Ohio.

CHAINS

Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

CHAINS, AUTOMOBILE ENGINE

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

CHAINS, COAL CUTTING

Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

CHAINS, DRIVE

Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

CHAINS, FRONT END

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

CHAIN LUBRICANTS

Standard Oil Co. (Ind.), Chicago, Ill.

CHAINS, OILING

Morse Chain Co., Ithaca, N. Y.

CHAINS, POWER TRANSMISSION

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

CHAINS, Silent (Bush-Pin Joint)

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CHAINS, SILENT (Rocker-Joint)

Morse Chain Co., Ithaca, N. Y.

CHAINS, SLING

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Morse Chain Co., Ithaca, N. Y.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Central Frog & Switch Co., Cincinnati, Ohio.

CLAMPS, ROSE

Knox Mfg. Co., Philadelphia, Pa.

CLAMPS (Mine)

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CLAMPS (Trolley)

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Ohio Brass Co., Mansfield, Ohio.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CLAMPS, WIRE ROPE

American Steel & Wire Co., Chicago, Ill., and New York.

John A. Roebling's Sons Co., Trenton, N. J.

CLIPS, WIRE ROPE

American Steel & Wire Co., Chicago, Ill., and New York.

John A. Roebling's Sons Co., Trenton, N. J.

CLUTCHES

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Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COAL CLEANING MACHINERY

American Coal Cleaning Corp., Welch, W. Va.

American Rheolaveur Corporation, Wilkes-Barre, Pa.

G. R. Delamater, 3233 Chadbourne Road, Cleveland, Ohio.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Roberts & Schaefer Co., Chicago, Ill.

COAL COMPANIES

Lehigh Coal & Navigation Co., Philadelphia, Pa.

Thorne, Neale & Co., Philadelphia, Pa.

COAL CONVEYING MACHINERY

American Coal Cleaning Corp., Welch, W. Va.

COAL CRUSHERS

Connellville Mfg. & Mine Supply Co., Connellville, Pa.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COAL CRUSHERS & ROLLS

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Vulcan Iron Works, Wilkes-Barre, Pa.

COAL CUTTERS

Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

Ingersoll-Rand Co., 11 Broadway, New York City.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

COAL HANDLING MACHINERY

American Coal Cleaning Corp., Welch, W. Va.

Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Joy Manufacturing Co., Franklin, Pa.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Mining Safety Device Co., Bowerston, Ohio.

Roberts & Schaefer Co., Chicago, Ill.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Joy Manufacturing Co., Franklin, Pa.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

Ingersoll-Rand Co., 11 Broadway, New York City.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

COAL MINING PLANTS

American Coal Cleaning Corp., Welch, W. Va.

Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

Ingersoll-Rand Co., 11 Broadway, New York City.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

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American Coal Cleaning Corp., Welch, W. Va.

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Roberts & Schaefer Co., Chicago, Ill.

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American Coal Cleaning Corp., Welch, W. Va.

G. R. Delamater, 3233 Chadbourne Road, Cleveland, Ohio.

Roberts & Schaefer Co., Chicago, Ill.

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G. R. Delamater, 3233 Chadbourne Road, Cleveland, Ohio.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Ingersoll-Rand Co., 11 Broadway, New York City.

COMPRESSORS, MINE CAR

Ingersoll-Rand Co., 11 Broadway, New York City.

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CONCRETE REINFORCEMENT

American Steel & Wire Co., Chicago, Ill., and New York.

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Ingersoll-Rand Co., 11 Broadway, New York City.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONTEST OUTFITS AND PRIZES

Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

CONTROLLERS

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Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONVERTERS, COPPER

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONVEYORS

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

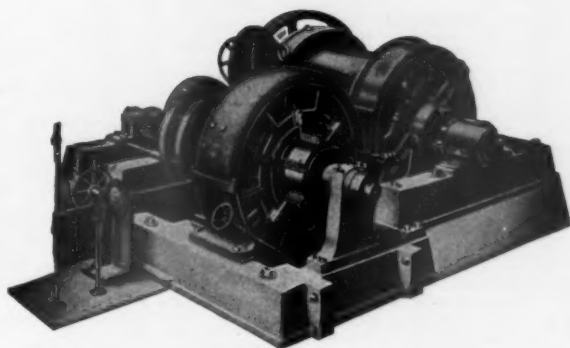
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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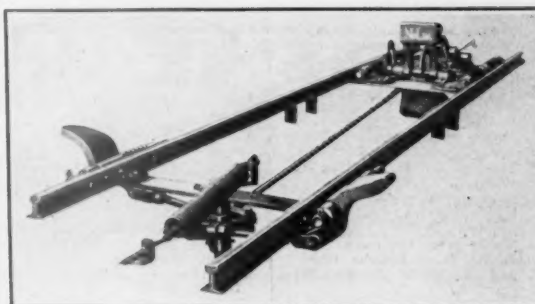
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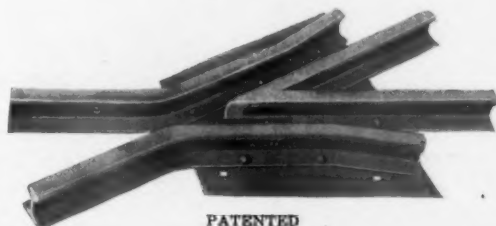
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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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American Coal Cleaning Corp., Welch, W. Va.
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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Robinson Ventilating Co., Zelenople, Pa.

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Vulcan Iron Works, Wilkes-Barre, Pa.

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John A. Roebling's Sons Co., Trenton, N. J.

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Pennsylvania Drilling Co., Pittsburgh, Pa.

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Fawcett Machine Co., Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

COUPLINGS, ROCK DRILL

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West Virginia Rail Co., Huntington, W. Va.

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Central Frog & Switch Co., Cincinnati, Ohio.

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Standard Oil Co. (Ind.), Chicago, Ill.

CRUSHERS

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Symons Bros. Co., Chicago, Ill.

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Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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Standard Oil Co. (Ind.), Chicago, Ill.

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CYCLONE DUST COLLECTORS

American Coal Cleaning Corp., Welch, W. Va.

DECARBONIZING APPARATUS

Oxweld Acetylene Co., 30 E. 42d St., New York City.

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American Rheolaveur Corporation, Wilkes-Barre, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

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Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

DIAMOND DRILLING CARBON

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DIAMONDS, BLACK (See Carbon and Bortz)

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R. S. Patrick, Sellwood Building, Duluth, Minn.

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R. S. Patrick, Sellwood Building, Duluth, Minn.

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DOORS, AUTOMATIC MINE

American Mine Door Co., Canton, Ohio.

DOWNIE DEEP WELL PUMPS

Keystone Churn Drill Co., Beaver Falls, Pa.

DRIFTERS, DRILL

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DRILLERS' DIAMONDS

Diamond Drill Carbon Co., World Bldg., New York.

DRILLING CONTRACTORS

Pennsylvania Drilling Co., Pittsburgh, Pa.

DRILLING, DIAMONDS FOR

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R. S. Patrick, Sellwood Building, Duluth, Minn.

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Keystone Churn Drill Co., Beaver Falls, Pa.

DRILL BITS, Carbon (Diamonds) for

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R. S. Patrick, Sellwood Building, Duluth, Minn.

DRILL, CARBON (Diamonds) for

Diamond Drill Carbon Co., World Bldg., New York.
R. S. Patrick, Sellwood Building, Duluth, Minn.

DRILL COLUMNS & MOUNTINGS

Ingersoll-Rand Co., 11 Broadway, New York City.

DRILL LUBRICANTS

Standard Oil Co. (Ind.), Chicago, Ill.

DRILLER'S DIAMONDS

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Ingersoll-Rand Co., 11 Broadway, New York City.
Keystone Churn Drill Co., Beaver Falls, Pa.

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Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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DRILLS, MINERAL PROSPECTING

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DRILLS, PNEUMATIC

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DRILLS, PROSPECTING

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Ingersoll-Rand Co., 11 Broadway, New York City.
Keystone Churn Drill Co., Beaver Falls, Pa.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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DUST FILTERS

American Coal Cleaning Corp., Welch, W. Va.

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E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

DYNAMOS

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Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

DYNAMO OILS

Standard Oil Co. (Ind.), Chicago, Ill.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.
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Roebling's Sons Co., John A., Trenton, N. J.

ELECTRIC BLASTING CAPS

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ELECTRIC HOISTING MACHINERY

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

ELECTRIC LOCOMOTIVES

General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
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Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

ELECTRIC LOCOMOTIVE CABLES

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American Steel & Wire Co., Chicago, Ill., and New York.

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General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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ELEVATOR AND HOIST MOTORS

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ELEVATOR MACHINERY

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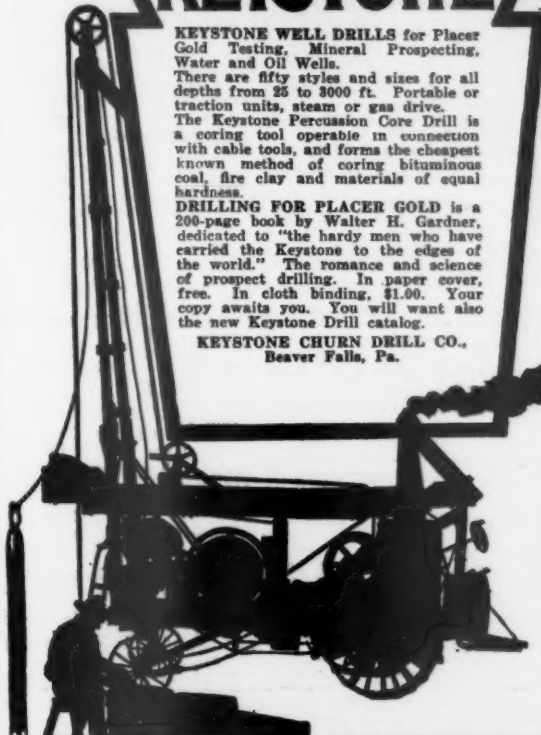
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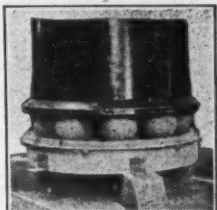
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Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

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General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

LOCOMOTIVES, TROLLEY
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

LONGWALL MACHINES
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

LUBRICANTS
Keystone Lubricating Co., Philadelphia, Pa.
Standard Oil Co. (Ind.), Chicago, Ill.

LUBRICATORS
Keystone Lubricating Co., Philadelphia, Pa.

MACHINE OILS
Standard Oil Co. (Ind.), Chicago, Ill.

MACHINERY, TRANSMISSION (Power)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

MANIFOLDS, OXYGEN
Oxweld Acetylene Co., 30 E. 42d St., New York City.

MAST ARM ROPE, Galvanized
John A. Roebling's Sons Co., Trenton, N. J.

METHANE RECORDER, CONTINUOUS
Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

MILL GREASES
Standard Oil Co. (Ind.), Chicago, Ill.

MILLS, ROD & BALL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MILLS, STAMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MINE CAR AXLES
American Car & Foundry Co., 30 Church St., New York City.
Hockensmith Wheel & Mine Car Co., Penn. Pa.

MINE CAR BEARINGS
Hyatt Roller Bearing Co., Newark, N. J.
Timken Roller Bearing Co., Canton, Ohio.

MINE CAR BOXES
American Car & Foundry Co., 30 Church St., New York City.
Hockensmith Wheel & Mine Car Co., Penn. Pa.

MINE CAR FORGINGS
American Car & Foundry Co., 30 Church St., New York City.
Hockensmith Wheel & Mine Car Co., Penn. Pa.

MINE CAR LUBRICANTS
Keystone Lubricating Co., Philadelphia, Pa.
Standard Oil Co. (Ind.), Chicago, Ill.

MINE CAR PARTS
American Car & Foundry Co., 30 Church St., New York City.
Hockensmith Wheel & Mine Car Co., Penn. Pa.
Phillips Mine & Mill Supply Co., Pittsburgh, Pa.

MINE CAR ROLLER BEARINGS
American Car & Foundry Co., 30 Church St., New York City.

MINE CARS
American Car & Foundry Co., 30 Church St., New York City.
Enterprise Wheel & Car Corporation, Huntington, W. Va.
Hockensmith Wheel & Mine Car Co., Penn. Pa.
Phillips Mine & Mill Supply Co., Pittsburgh, Pa.

MINE CAR WHEELS
American Car & Foundry Co., 30 Church St., New York City.
Hockensmith Wheel & Mine Car Co., Penn. Pa.

MINE DOORS, AUTOMATIC
American Mine Door Co., Canton, Ohio.

MINE LOCOMOTIVE CABLE
American Steel & Wire Co., Chicago, Ill., and New York.
General Electric Co., Schenectady, N. Y.
John A. Roebling's Sons Co., Trenton, N. J.

MINE TIES
Central Frog & Switch Co., Cincinnati, Ohio.

MINING & METALLURGICAL MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

MINING MACHINE CABLE
General Electric Co., Schenectady, N. Y.
John A. Roebling's Sons Co., Trenton, N. J.

MINING MACHINES
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

MINING MACHINES (Electric)
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

MINING MACHINES (Government Approved)
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

MINING MACHINERY BEARINGS
Hyatt Roller Bearing Co., Newark, N. J.

MINING SPECIALTIES
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Standard Oil Co. (Ind.), Chicago, Ill.

MOTORS
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General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MOUNTED BOTTOM CUTTERS
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

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John A. Roebling's Sons Co., Trenton, N. J.

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Linde Air Products Co., 30 East 42d St., New York City.

OIL RIGS, PORTABLE
Keystone Churn Drill Co., Beaver Falls, Pa.

OILS
Standard Oil Co. (Ind.), Chicago, Ill.

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ORE, CARNOTITE & VANADIUM
O. Barlow Willmarth, Georgetown, Colo.

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Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

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Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

OXYGEN GAS
Linde Air Products Co., 30 East 42d St., New York City.

OXYGEN PUMP, HIGH PRES-SURE
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Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.

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du Pont Powder Co., The E. I., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

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Standard Oil Co. (Ind.), Chicago, Ill.

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Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

PIPE (Genuine Wrought Iron)
A. M. Byers Co., Pittsburgh, Pa.

PIPE (Wood)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

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American Coal Cleaning Corp., Welch, W. Va.

PNEUMATIC SIZING MACHINERY
American Coal Cleaning Corp., Welch, W. Va.

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Ingersoll-Rand Co., 11 Broadway, New York City.

PNEUMATIC TOOL LUBRICANT
Standard Oil Co. (Ind.), Chicago, Ill.

PORTABLE TRACK
Central Frog & Switch Co., Cincinnati, Ohio.

PORTABLE TURNOUTS
Central Frog & Switch Co., Cincinnati, Ohio.

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Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

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E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.

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American Steel & Wire Co., Chicago, Ill., and New York.
General Electric Co., Schenectady, N. Y.
John A. Roebling's Sons Co., Trenton, N. J.

POWER SHOVELS
Keystone Churn Drill Co., Beaver Falls, Pa.

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The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Oxweld Acetylene Co., 30 E. 42d St., New York City.

PRESERVATIVE EQUIPMENT
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United Wood Treating Corp., 1138 Lake Shore Drive, Chicago, Ill.

PRESERVATIVES, WOOD
American Lumber & Treating Corp., 1138 Lake Shore Drive, Chicago, Ill.
United Wood Treating Corp., 1138 Lake Shore Drive, Chicago, Ill.

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Standard Oil Co. (Ind.), Chicago, Ill.

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Ingersoll-Rand Co., 11 Broadway, New York City.
Pennsylvania Drilling Co., Pittsburgh, Pa.

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PULLEYS, BALL OR ROLLER BEARING
S K F Industries, New York City

PULLEYS, CLUTCH, FRICTION
S K F Industries, New York City.

PULLEYS, LOOSE
S K F Industries, New York City.

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Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, AIR LIFT
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, Boiler Feed
Ingersoll-Rand Co., 11 Broadway, New York City.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

PUMPS, CENTRIFUGAL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.
Keystone Churn Drill Co., Beaver Falls, Pa.

PUMPS, DEEP WELL
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Keystone Churn Drill Co., Beaver Falls, Pa.

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Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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Ingersoll-Rand Co., 11 Broadway, New York City.

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PUMPS, Inclined Shaft
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PUMPS, MINE
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.

PUMPS, Sinking
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, PNEUMATIC AIR LIFT
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, POWER
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.

PUMPS, SAND
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.

PUMPS, STEAM
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.

PUMPS, VACUUM
Ingersoll-Rand Co., 11 Broadway, New York City.

PUNCHES, Drill Steel
Ingersoll-Rand Co., 11 Broadway, New York City.

QUARRYING MACHINERY
Ingersoll-Rand Co., 11 Broadway, New York City.

QUARTZ CRYSTAL
Diamond Drill Carbon Co., World Bldg., New York.

RADIO ACTIVE ORE
O. Barlow Willmarth, Georgetown, Colo.

RADIUM ORE
O. Barlow Willmarth, Georgetown, Colo.

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American Steel & Wire Co., Chicago, Ill., and New York.
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

RAIL BRACES
Central Frog & Switch Co., Cincinnati, Ohio.

RAILWAY SUPPLIES
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

RAMMERS, Pneumatic
Ingersoll-Rand Co., 11 Broadway, New York City.

RECEIVERS, AIR
Ingersoll-Rand Co., 11 Broadway, New York City.

REGULATORS, Welding and Cutting, Compressed Gas
Oxweld Acetylene Co., 30 E. 42d St., New York City.

REHEATERS, Air
Ingersoll-Rand Co., 11 Broadway, New York City.

REINFORCING BARS
Sweet's Steel Co., Williamsport, Pa.
West Virginia Rail Co., Huntington, W. Va.

RESCUE APPARATUS
Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

RETARDERS
Mining Safety Device Co., Bowers-ton, Ohio.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

RIVER CROSSING SUSPENSION WIRE, Galvanized
John A. Roebling's Sons Co., Trenton, N. J.

ROCK DISPOSAL EQUIPMENT
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

ROCK DRILLS
Diamond Machine Co., Monongahela, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.

ROCK DUSTING EQUIPMENT
American Mine Door Co., Canton, Ohio.
Diamond Machine Co., Monongahela, Pa.
Mine Safety Appliances Co., Brad-dock Ave. and Thomas Blvd., Pittsburgh, Pa.

RODS, WELDING
Ohio Brass Co., Mansfield, Ohio.
Oxweld Acetylene Co., 30 E. 42d St., New York City.

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Enterprise Wheel & Car Corporation, Huntington, W. Va.
Hyatt Roller Bearing Co., Newark, N. J.
Timken Roller Bearing Co., Canton, Ohio.

ROLLS (Crushing)
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Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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ROPE, TRANSMISSION
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ROPE, WIRE
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John A. Roebling's Sons Co., Trenton, N. J.

ROTARY DRYERS
Vulcan Iron Works, Wilkes-Barre, Pa.

ROTARY COOLERS
Vulcan Iron Works, Wilkes-Barre, Pa.

ROTARY DUMPS
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Mining Safety Device Co., Bowers-ton, Ohio.
Phillips Mine & Mill Supply Co., Pittsburgh, Pa.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

ROTARY ROASTERS
Vulcan Iron Works, Wilkes-Barre, Pa.

RUNNING ROPE, Galvanized
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, N. J.

SAFETY APPLIANCES, MINE
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

SAFETY FUSE
Hercules Powder Co., Wilmington, Del.

SAND DRYERS
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

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John A. Roebling's Sons Co., Trenton, N. J.

SAWS (Air)
Ingersoll-Rand Co., 11 Broadway, New York City.

SCRAPER LOADERS
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

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Phillips Mine & Mill Supply Co., Pittsburgh, Pa.

SCREENS (Anti-Gravity)
American Coal Cleaning Corp., Welch, W. Va.

SCREENS, HORIZONTAL
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

SCREENS, PERFORATED METAL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SCREENS, REVOLVING
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SCREENS, SHAKER
Hendrick Mfg. Co., Carbondale, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.

SCREENS (Vibrating)
American Coal Cleaning Corp., Welch, W. Va.

SCREENS & WASHERIES
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Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
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Hyatt Roller Bearing Co., Newark, N. J.

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Myers-Whaley Co., Knoxville, Tenn.
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American Steel & Wire Co., Chicago, Ill., and New York.
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SIGNS

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SIGNS (Mine)

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American Mine Door Co., Canton, Ohio.
Ohio Brass Co., Mansfield, Ohio.

SPLICE, INSULATOR

American Mine Door Co., Canton, Ohio.

SPLICE, TROLLEY WIRE

General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

SPLICERS, TROLLEY

American Mine Door Co., Canton, Ohio.
Ohio Brass Co., Mansfield, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

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SPROCKETS, COMPENSATING

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
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SPROCKETS (Shearing Pin)

Morse Chain Co., Ithaca, N. Y.

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SPROCKETS, SPRING

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

SPUR GEAR DRIVES

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

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STEEL, ALLOY

Timken Roller Bearing Co., Canton, Ohio.

STEEL CROSS TIES

Carnegie Steel Co., Pittsburgh, Pa.
Sweet's Steel Co., Williamsport, Pa.
West Virginia Rail Co., Huntington, W. Va.

STEEL, ELECTRIC FURNACE

Timken Roller Bearing Co., Canton, Ohio.

STEEL, HOLLOW AND SOLID

Drill
Ingersoll-Rand Co., 11 Broadway, New York City.

STEEL, NICKEL

Timken Roller Bearing Co., Canton, Ohio.

STEEL, NICKEL, MOLYBDENUM

Timken Roller Bearing Co., Canton, Ohio.

STEEL, OPEN HEARTH

Timken Roller Bearing Co., Canton, Ohio.

STEEL, REINFORCING

American Mine Door Co., Canton, Ohio.

STEEL, SHAPES, PLATES, BARS, ETC.

Carnegie Steel Co., Pittsburgh, Pa.

STEEL, Special Analysis

Timken Roller Bearing Co., Canton, Ohio.

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West Virginia Rail Co., Huntington, W. Va.

STEPS, SAFETY STAIR AND LADDER

Hendrick Mfg. Co., Carbondale, Pa.

STOPERS, ROCK DRILL

Ingersoll-Rand Co., 11 Broadway, New York City.

STORAGE BATTERY LOCOMOTIVES

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The Jeffrey Mfg. Company, 958-99

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John A. Roebling's Sons Co., Trenton, N. J.

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Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

SWITCHES

Central Frog & Switch Co., Cincinnati, Ohio.
Sweet's Steel Co., Williamsport, Pa.

SWITCHES, ALTERNATING

Mining Safety Device Co., Bowers-ton, Ohio.

SWITCHES (Disconnecting and Electric)

General Electric Co., Schenectady, N. Y.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

SWITCHES AND FROGS,

TROLLEY
American Mine Door Co., Canton, Ohio.

Central Frog & Switch Co., Cincinnati, Ohio.

Ohio Brass Co., Mansfield, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TACKLE BLOCKS

John A. Roebling's Sons Co., Trenton, N. J.

TANKS

Hendrick Mfg. Co., Carbondale, Pa.

TELEGRAPH AND TELEPHONE WIRES AND CABLES

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John A. Roebling's Sons Co., Trenton, N. J.

American Steel & Wire Co., Chicago, Ill., and New York.

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American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, N. J.

THIMBLES

American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, N. J.

TIES (Steel, Mine)

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Central Frog & Switch Co., Cincinnati, Ohio.

TILLER ROPE

John A. Roebling's Sons Co., Trenton, N. J.

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United Wood Treating Corp., 1138 Lake Shore Drive, Chicago, Ill.

TIMBERS, STEEL MINE

Carnegie Steel Co., Pittsburgh, Pa.

TIPPLES

American Coal Cleaning Corp., Welch, W. Va.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

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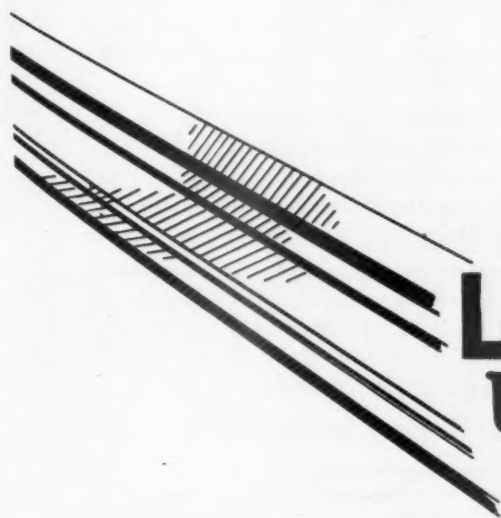
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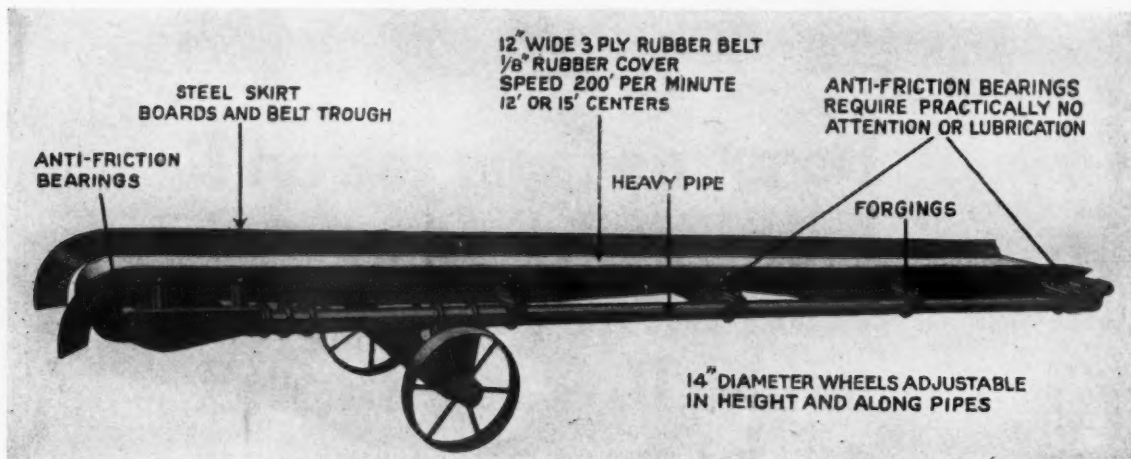


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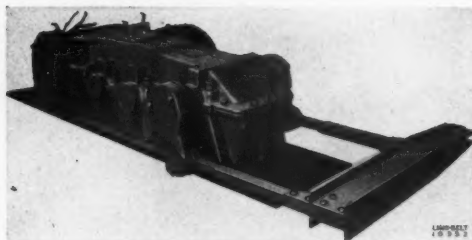
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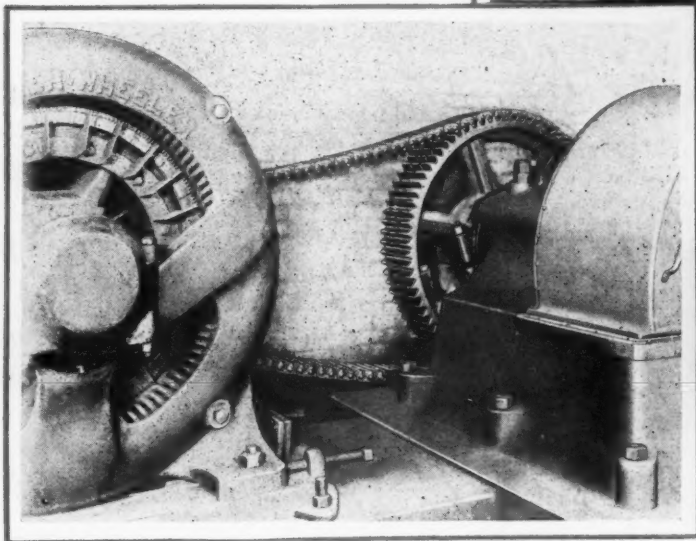
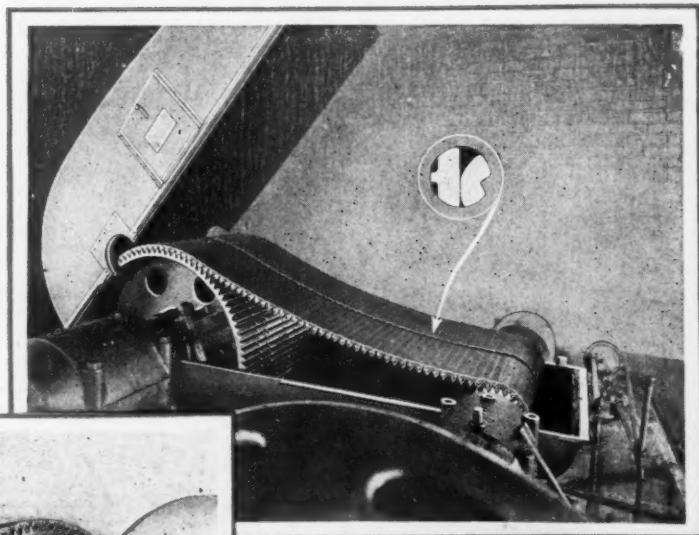
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